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COVER ARTIST
Jonatan Catalán
SOFTWARE
Maya, Arnold, Photoshop

Jonatan Catalán started as a lighting artist before founding Keytoon Animation Studio, working with clients such as Disney Channel, Paramount Pictures and Mattel. After three years he started working freelance, which led him to work with DreamWorks Animation as visual development artist on projects like *Trollhunters* and *3Below*, where he got two Emmy nominations in 2016 and 2017.

- www.jonatancatalan.com

EDITOR'S

WELCOME

The VFX of horror, 3Below and Maleficent 2!

Fully animated movies and TV series are always popular and can often push the boundaries of CG, as they have fewer pressures from the execs, compared to the standard summer blockbuster.

This issue we take a look at Guillermo Del Toro's beautiful *3Below*, which adorns our cover. We delve behind the scenes to find out how the popular Netflix show was put together.

Not content with that we also explore Disney's *Maleficent: Mistress of Evil*, which is laden with lush environments, quirky CG characters and a huge range of set pieces and visual effects.

If that is a bit too light-hearted for your tastes then check out our feature on the VFX of horror movies, to discover how to give your own audience the willies!

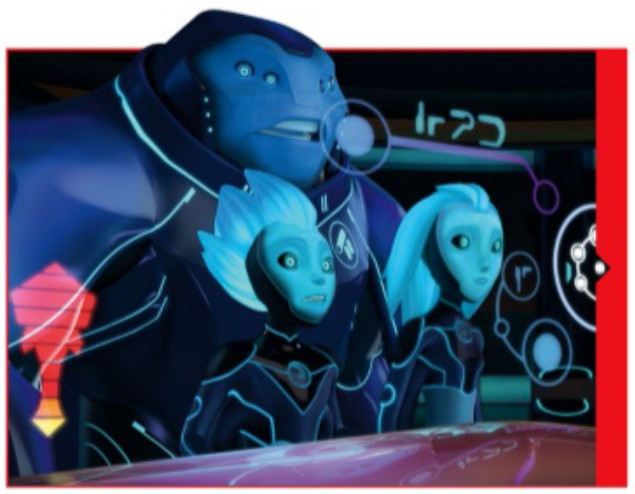
If you are looking to upskill then look no further: as well as our regular Q and A section we have our veteran artists share their techniques for everything from setting up smart modular substances, building realistic sci-fi cities right through to taking your Maya models into ZBrush for sculpting and detailing.

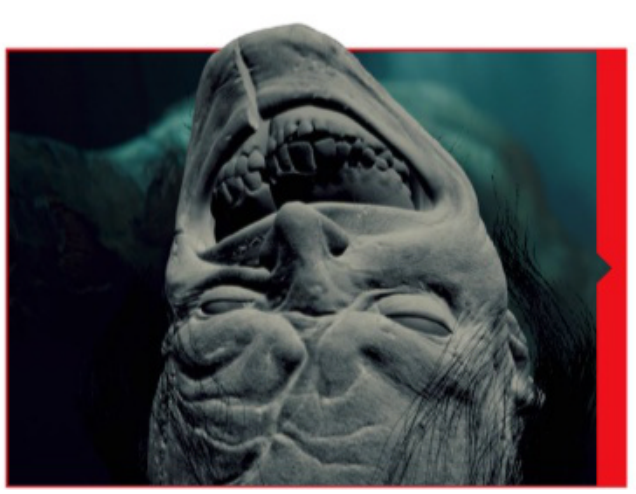
If it's time to upgrade your hardware, check out our group test to see which new laptop could be the best one to support your work.

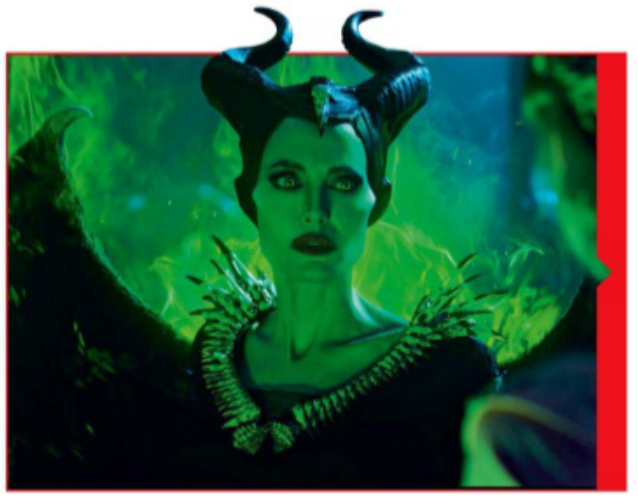
Rob

Rob Redman, Editor
rob.redman@futurenet.com

SPOTLIGHT ON OUR CONTRIBUTORS







Ian Failes
Ian is a regular contributor to **3D World**, and in this issue he takes you behind the scenes on the Netflix show *3Below*.
www.beforesandafters.com

Brad Thorne
Our in-house staff writer Brad writes our lead features and keeps up to date with the latest industry trends.
creativeblog.com/tag/3d

James Clarke
Journalist and writer James Clarke returns this month with a behind-the-scenes look at *Maleficent: Mistress Of Evil*.
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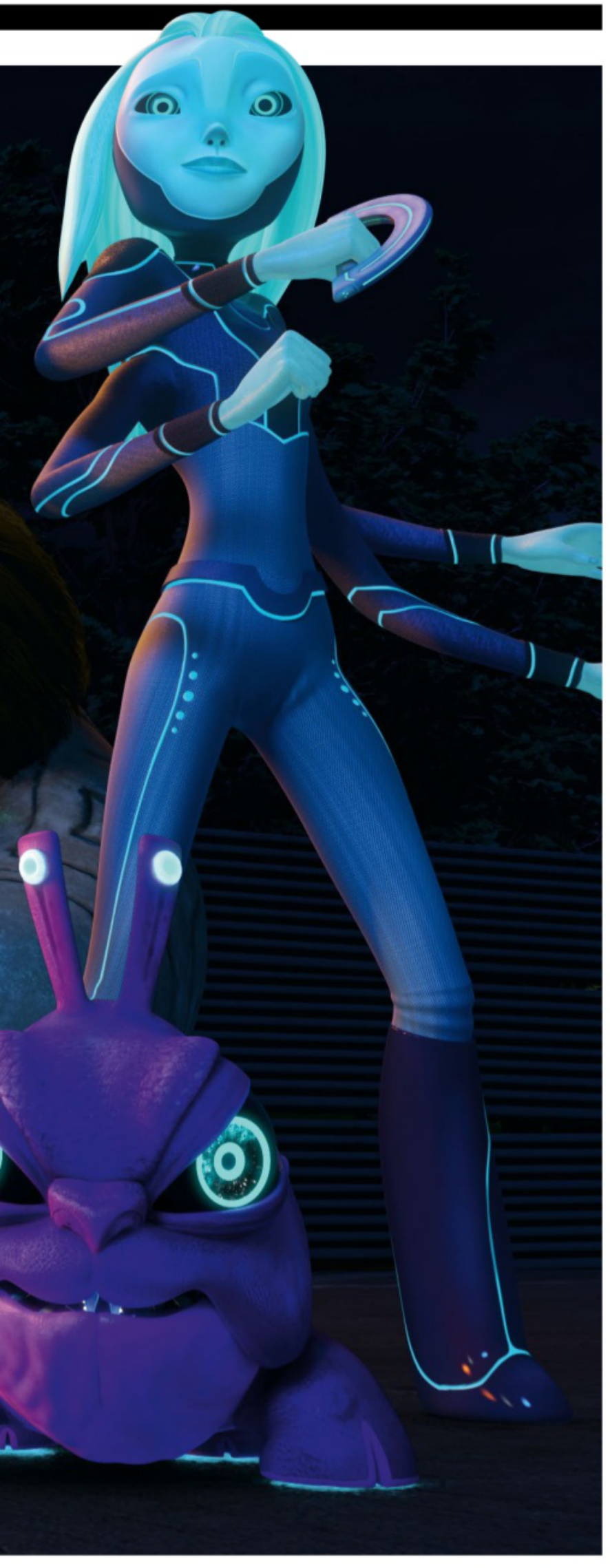

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The Gallery

The best digital art from the 3DArtist community

"IT WAS A DIFFERENT APPROACH TO HOW I USUALLY MODEL, BUT SNAPSHOT 3D IS A VERY POWERFUL FEATURE"

BETA TEST

ARTIST
Franco Carlesimo
SOFTWARE
ZBrush, 3ds Max, V-Ray, After Effects

3D modeller Franco Carlesimo created this image during the beta stage of ZBrush 2019. "It took me around one month to do it from start to finish," he tells 3D World. Carlesimo took full advantage of ZBrush's new Snapshot 3D feature, which allows users to extrude 3D objects from a 2D image. "It was hard because it's a different approach to how I usually model," he adds, "but it was fun to test out and is a very powerful feature."

The ZRemesher 3.0 feature was employed in order to achieve the image's detailed topology; according to Carlesimo, this feature works particularly well on models that don't need to be rigged for animation.

"What I enjoyed the most was designing the character and the vehicle," says Carlesimo. Time was spent figuring out how he could model the elements using the new tools that ZBrush has introduced. All of Carlesimo's work begins as an idea and rough pencil concept, "then I start with a chunk of digital clay and start moving it around until I get the general forms I'm looking for." He then completes most of his model in an A-pose before using ZBrush's Transpose Master tool to create the final pose.

instagram.com/francocarlesimo

PRIESTESS

ARTIST
Romain Pommier
SOFTWARE
ZBrush, Marvelous Designer, KeyShot, Photoshop, Lightroom

Toronto-based freelance character and creature modeller, Romain Pommier, spent just one day sculpting Priestess and a further half a day rendering. “It was supposed to be a speed sculpt, so I had to be sure of what I was doing,” he tells **3D World**. “Using cloth simulation and finding a process to mix Polypaint with the KeyShot material editor was definitely unusual for this type of work.”

Pommier’s favourite part of the process was creating the concept, and he began with the basic shapes, finding lines and curves that made sense for the sculpt. “The final step of lighting is also pretty enjoyable,” he adds. “I enjoy figuring out how to make the image look better with lights and mood.”

Marvelous Designer was employed to enhance texture and add something special to the character. “I try to use materials to create a variety of roughness and surface information,” explains Pommier. “It’s a good way to add complexity and contrast to my work, as well as highlight certain parts.” The finishing touches were then put on the character using Photoshop and Lightroom.

Everything from movies to traditional arts, music and photography inspires Pommier. “I try to always work with references,” he continues, “real life examples and the work of other artists. It’s the best way to understand how things work and learn what makes a good visual.”

instagram.com/rom.pommier

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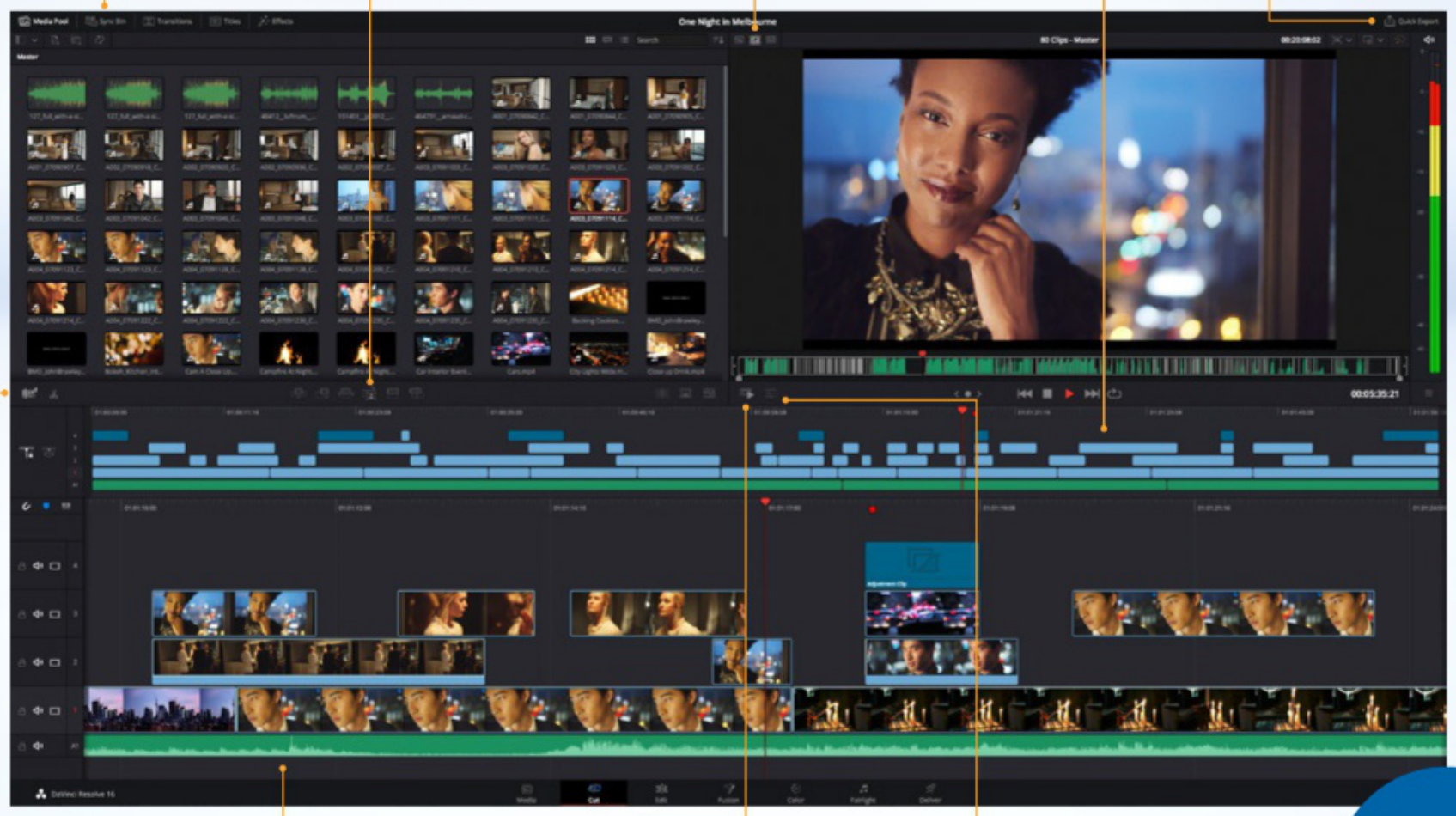

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SUSANOO'S FIGHTER

ARTIST
Pierre Hubert
SOFTWARE
Marvelous Designer, Maya, ZBrush, XGen, Substance Painter, RenderMan, Natron, Photoshop

Paris-based 3D artist Pierre Hubert began this project six months ago, taking time to learn Marvelous Designer in order to achieve his desired result. Discussing how he created the character's convincing windbreaker, Hubert says: "I wanted a realistic look and couldn't see myself sculpting the whole windbreaker, so I went through a lot of simulations." He also ran simulations in XGen, which he later reworked, to achieve wind-blown hair. Maya Fluid Effects allowed Hubert to realise the smoke that comes from the fighter's gun.

The greatest challenge was posed by the simulations, ensuring that the strap, bag and weapon pressed properly on the character's clothes. Hubert also honed the hair and smoke until they were reacting correctly to the wind.

"The weapon's modelisation and texturing are what I enjoyed working on the most," he continues, "as well as researching the colour palette that I wanted to use for the character and their weapon."

Each of Hubert's projects begins with a main reference, and this particular piece was inspired by a concept from his friend Leo Gouvert. Currently much of his inspiration comes from Japanese culture, as well as the work of other artists like Ian Spriggs, Raf Grassetti and Pablo Munoz Gomez. "It inspires me a lot and motivates me to always have an ever more precise result," adds Hubert. "Researching the most realistic way to render a fantastic or a completely invented subject is what fascinates me working in 3D."

artstation.com/pierrehbrt

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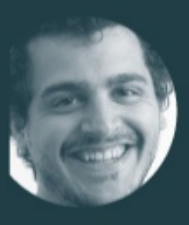


ARTIST
Luca Cappellano
SOFTWARE
Maya, ZBrush, Substance Painter, Marmoset Toolbag

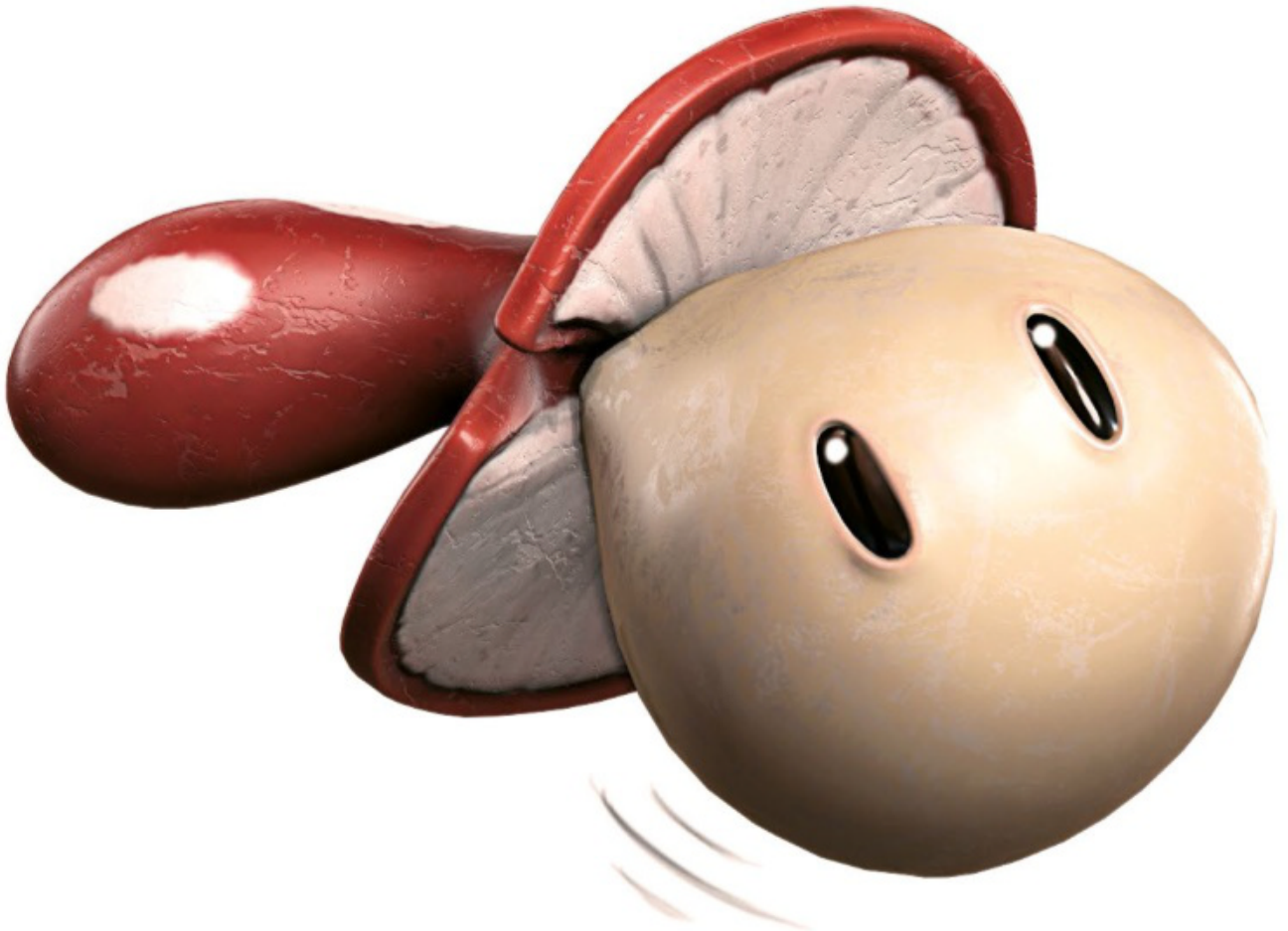
3D modeller and graphic designer Luca Cappellano spent around 80 hours of his spare time working on this fun image. "I mostly enjoyed making the rifle, the mushroom hat and the different decorations on the armour," he explains.

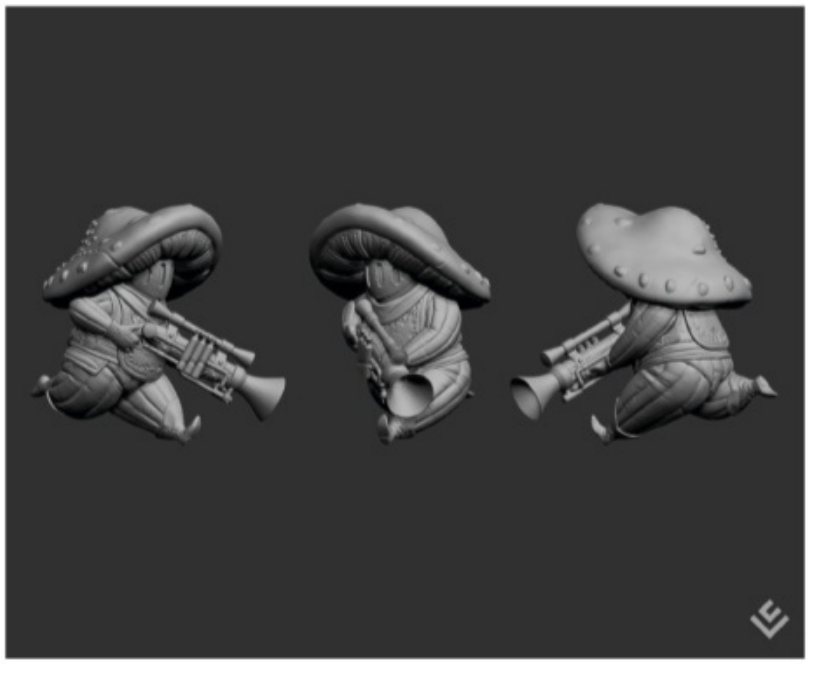
The artist avoided any unusual or notable techniques for this image, in favour of his trusty workflow. Usually Cappellano will set a specific goal for each project, endeavouring to embrace a different pipeline or learn new techniques. "In this case I simply wanted to improve my modelling skills," he adds.

The process begins with blocking out in Maya, before ZBrush is used to pose the character and hone the finer details. "Then I moved onto texturing in Substance Painter and completed the baking and rendering with Marmoset Toolbag," he explains. Inspiration often comes to Cappellano after exploring the internet for new and talented illustrators, and he adds: "My favourite artists are Jake Parker, Carlos Ortega Elizalde and Serge Birault."

kehpp.com

> I MOSTLY ENJOYED MAKING THE RIFLE, THE MUSHROOM HAT AND THE DIFFERENT DECORATIONS ON THE ARMOUR





PIZZA BREAK

ARTIST
Tomas Kral
SOFTWARE
Maya, ZBrush, Substance Painter, Nuke, Photoshop

In his own words, 3D artist Tomas Kral drinks coffee and pushes buttons for a living. He began work on this high-altitude image four months ago, working on it during his spare time, totalling about a month's worth of full-time work. Kral maintains that he used no unusual or notable techniques to create the image, "just standard CG magic combined with no sleep," he adds.

Each of Kral's images provides an opportunity to tell a story, something he enjoys immensely. He continues: "My main goal is to deliver an illustration of a scene that could be part of that story."

Kral typically works on his images at night, "when the family go to sleep I open up some Red Bull, pour it into my mouth and start working," he says. This process continues until Kral feels his image is finished. When it comes to inspiration, Kral cites "the usual," including the work of fellow artists as well as books, films and comics.

tomaskral.cz

THE ROOKIES

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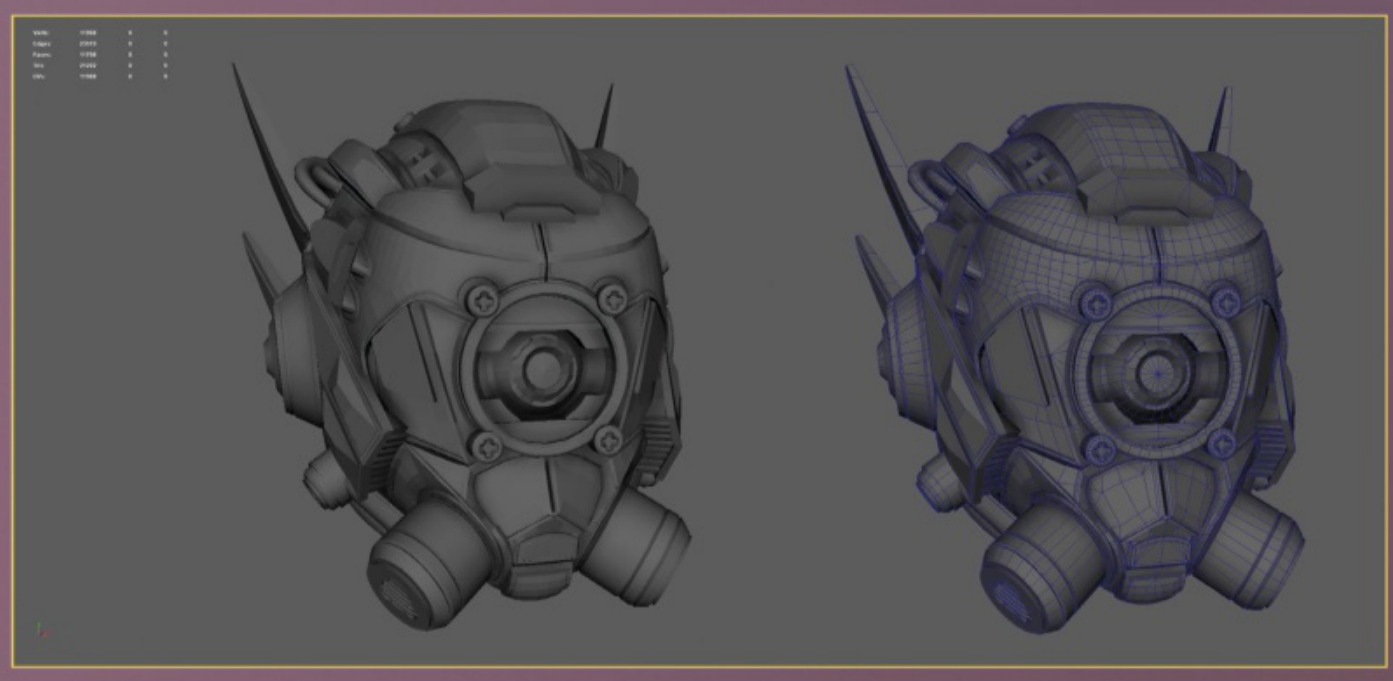
REWIND CYBORG

YEAR CREATED 2018
SOFTWARE ZBrush, Substance Painter, Autodesk Maya

This project was for a brief from Rewind in collaboration with the MA Games Art at the University of Hertfordshire. My goal was to create a 'human' cyborg. Online we see many sci-fi projects, and while they are always cool to look at, I get annoyed that there are so many 'lifeless' projects. In my project I researched giving cyborgs emotions.

www.marleenvijgen.com

ARTIST
Marleen Vijgen
After starting out as a game designer, I decided that I preferred creating characters. Joining the Game Art MA at the University of Hertfordshire, I stepped into the games industry.
LOCATION
Cambridge, United Kingdom



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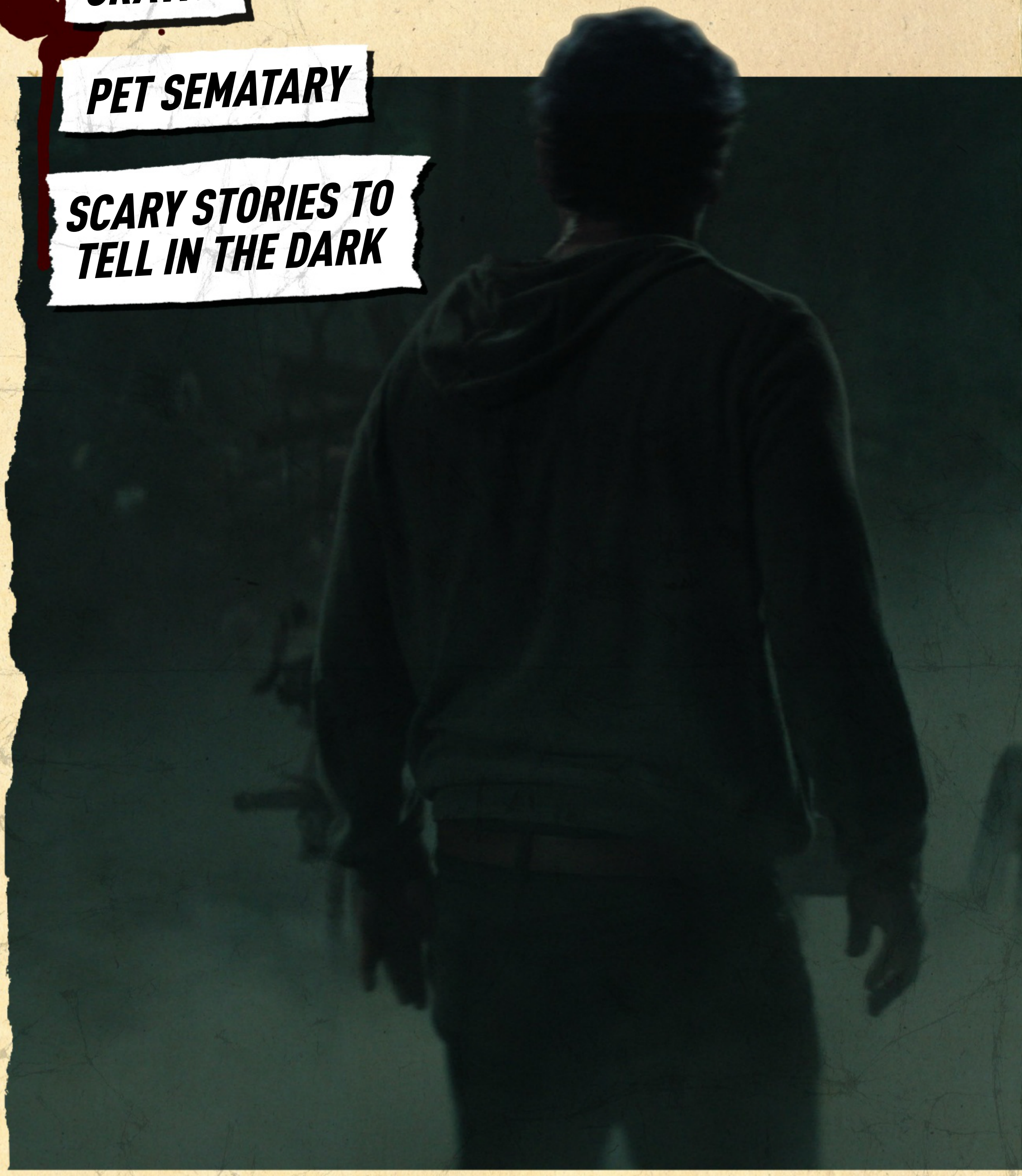

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ARTISTS FROM RODEO FX AND MR X GIVE 3D WORLD THE LOWDOWN ON THE ROLE OF VFX IN HORROR CINEMA

OH... THE HORROR!

Mr. X's otherworldly environment work for Stephen King adaptation *Pet Sematary*

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INSPIRING CG ARTISTS 3D WORLD

Top: One of Rodeo FX's huge CG alligators stalks its terrified prey

Rodeo FX delivered 244 VFX shots in a three-month post-production schedule for *Crawl*

The horror genre is often celebrated for its use of practical effects, combining ghoulish makeup and grotesque prosthetics with sound and editing to elicit fear in an uneasy audience. Digital effects, however, are as important as any other element in creating scary stories on-screen, and studios like Rodeo FX and Mr. X have become masters of the art. **3D World** has gathered top artists from these studios to discuss the role VFX plays in horror, the challenges it presents and their latest projects.

Thomas Montminy-Brodeur oversaw Rodeo FX's work on the killer alligator film *Crawl*, and discusses his approach to VFX in horror cinema. Mr. X reveal how they conjured nightmarish imagery for *Scary Stories To Tell In The Dark*, the supernatural chiller directed by André Øvredal and produced by Guillermo del Toro, and helped to create the titular location for Stephen King adaptation, *Pet Sematary*.

ENHANCING THE HORROR

"VFX is definitely something important in horror," says Thomas Montminy-Brodeur, VFX supervisor at Rodeo. "It's the perfect tool to exaggerate the visual and to immerse people in their own fears." From visualising blood and horrific injuries to creating mood in an environment, digital techniques play a varied role in the genre. "Horror is more than just visual," adds Montminy-Brodeur, "it's a feeling of immersion that you want to give to the viewer."

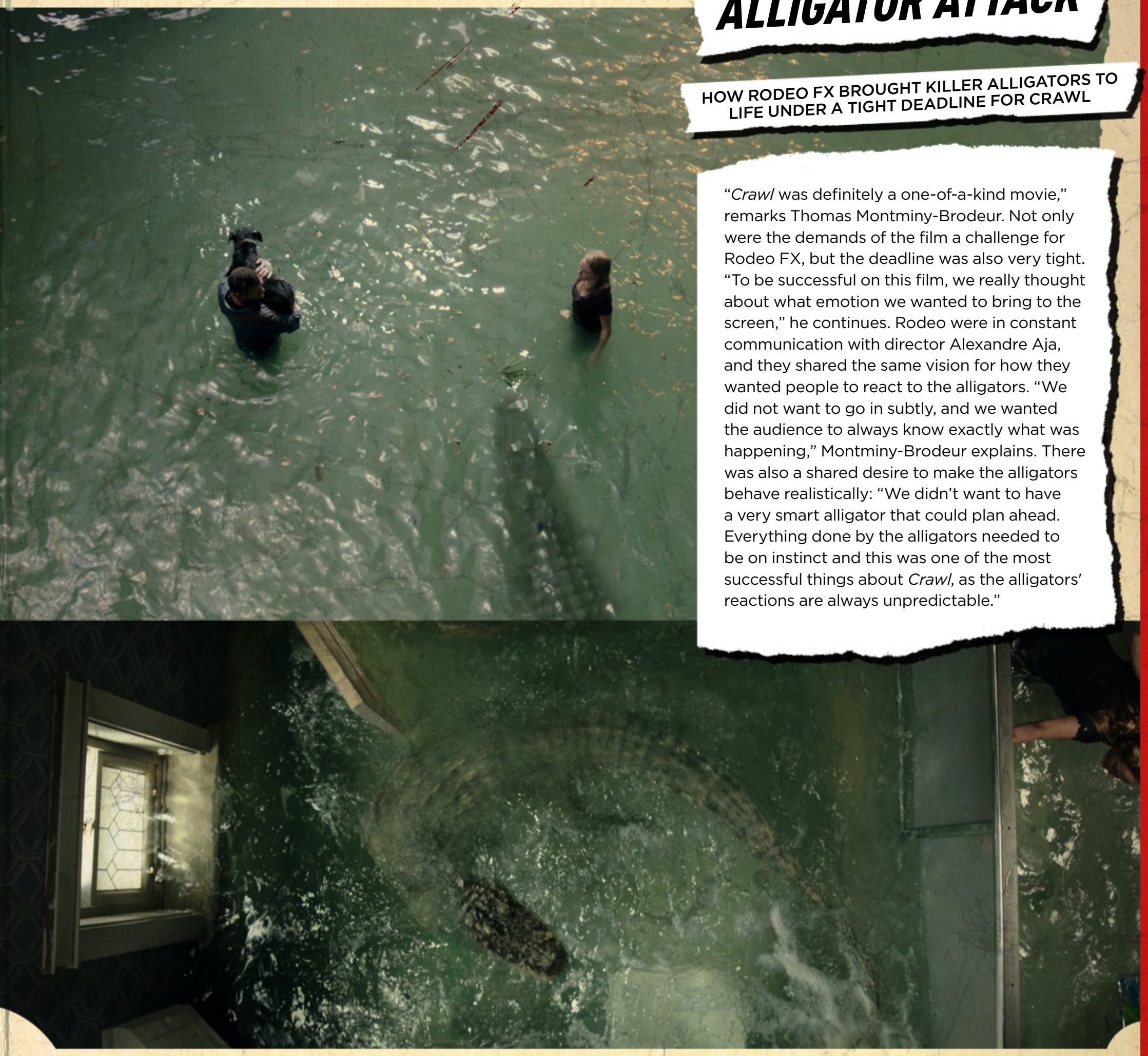
Cristian Camaroschi, CG supervisor at Mr. X, explains that the role of VFX in horror cinema is far bigger than viewers might realise: "Most prosthetics, well made as they may be, can often be hard to manoeuvre in. Therefore the audience can feel like they are watching an actor in a suit. What starts as a small digital enhancement often turns into a full replacement of the practical element in many shots."

An effective horror film lives and dies on the audience's immersion, and their belief in the dangers they see on-screen. This puts extra pressure on VFX professionals, as Camaroschi explains: "I think the biggest challenge is to remain in the shadows as much as possible. In a horror film, the moment the audience catches something that makes them wonder if it's VFX or practical, the tension that the

ALLIGATOR ATTACK

HOW RODEO FX BROUGHT KILLER ALLIGATORS TO LIFE UNDER A TIGHT DEADLINE FOR CRAWL

"*Crawl* was definitely a one-of-a-kind movie," remarks Thomas Montminy-Brodeur. Not only were the demands of the film a challenge for Rodeo FX, but the deadline was also very tight. "To be successful on this film, we really thought about what emotion we wanted to bring to the screen," he continues. Rodeo were in constant communication with director Alexandre Aja, and they shared the same vision for how they wanted people to react to the alligators. "We did not want to go in subtly, and we wanted the audience to always know exactly what was happening," Montminy-Brodeur explains. There was also a shared desire to make the alligators behave realistically: "We didn't want to have a very smart alligator that could plan ahead. Everything done by the alligators needed to be on instinct and this was one of the most successful things about *Crawl*, as the alligators' reactions are always unpredictable."



As well as CG alligators, Rodeo FX also worked on environments and water simulations for *Crawl*

filmmaker is trying to convey is broken. We have to blend our digital side to the practical so well that the viewer should not be able to tell where one starts and the other ends. We know we have done our job well if the audience leaves thinking there were no VFX."

While many horror filmmakers gravitate towards the use of in-camera effects, the reality is that elements often need to move and behave in ways that might be impossible to achieve practically. Montminy-Brodeur sees practical and digital approaches as symbiotic when creating cinematic scares. "I personally still love practical effects," he admits. "VFX should be used to exaggerate the direction of the story and things that are too complicated to build. We shouldn't think of VFX as replacing practical effects, it should be seen as both being complementary. VFX are very useful to give a sense of scale, and to mix what was done on set. Practical effects give an extra touch of realism; actors will always react better to a practical effect than something that doesn't exist yet."

Audiences are becoming more astute with their on-screen entertainment and are quick to call out any VFX that they deem unnecessary or unconvincing. However, VFX are enhancing horror in ways that many viewers don't realise. "There will always be things that nobody thinks of as VFX," says Montminy-Brodeur. "It can be elements as small as leaves ›

› flying in a storm, rain drops, or trees moving. Those are the elements that help the viewer stay immersed." Often called invisible effects, this kind of VFX work is crucial to creating an important sense of atmosphere in horror.

WAKING THE DEAD

André Øvredal, director of *Scary Stories To Tell In The Dark*, wanted a sense of realism to permeate the film's supernatural horror. Mr. X's VFX had to work in tandem with various practical elements to create numerous terrifying monsters. "We had tons of great photography since in all cases, except the CG spiders, there was always going to be some practical component of the monsters for us to match into," VFX supervisor Matt Glover tells **3D World**.

"We were presented with some beautifully made prosthetics, but they had limited ability to convey subtle emotions," adds Camaroschi. The team at Mr. X knew that their first step was to create facial rigs which their animators could use to bring the monsters to life. "Once André and Guillermo were happy with the performance, we would take these subtleties and combine them with their real-life counterparts in such a way that didn't take away from the sense that these creatures were present in the shot."

One of the film's monsters, however, proved to be a far more complex beast. The Jangly Man is a decomposing corpse, comprised of dismembered limbs that allow him to move in otherworldly ways. "Troy James, the actor inside the Jangly Man suit, is a great contortionist, yet even his body has limitations," says Camaroschi. "We had to give the Jangly Man the ability to do inhuman movements."

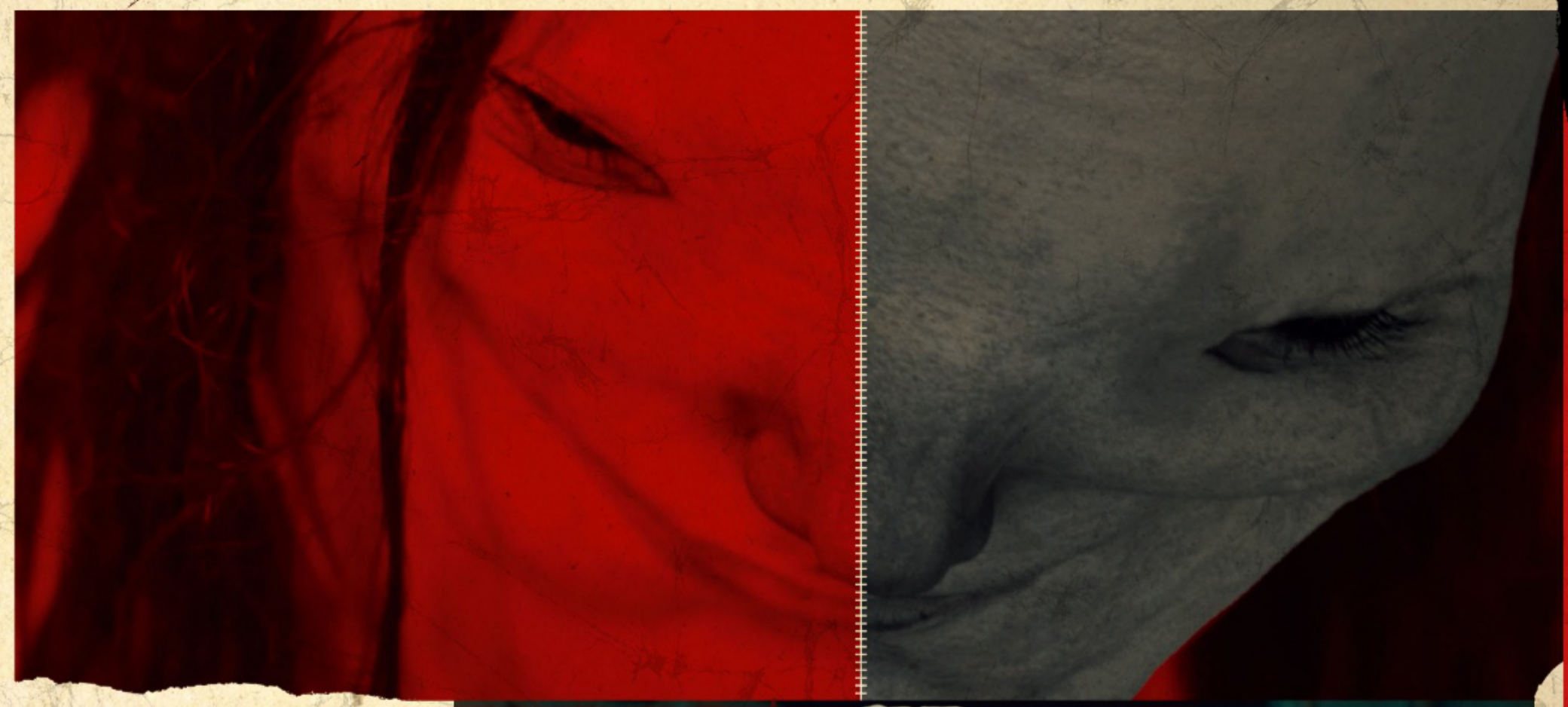
In his introductory sequence the Jangly Man's dismembered body is seen tumbling out of a chimney before putting itself back together. "We had two different rigs that could be switched out, so that animators could control separate limbs and then bring them together," explains Glover. "That whole initial sequence was a 100 per cent CG Jangly Man, and then once he stands upright we just replace his face. We took over his entire face for every shot because the mask didn't allow his eyes, nose or mouth to move. We had a number of full CG shots later as well, when Jangly was on the roof of the car, or climbing the fence and stairs etc. But we were almost always cutting back to back with a live-action shot, which was tricky."

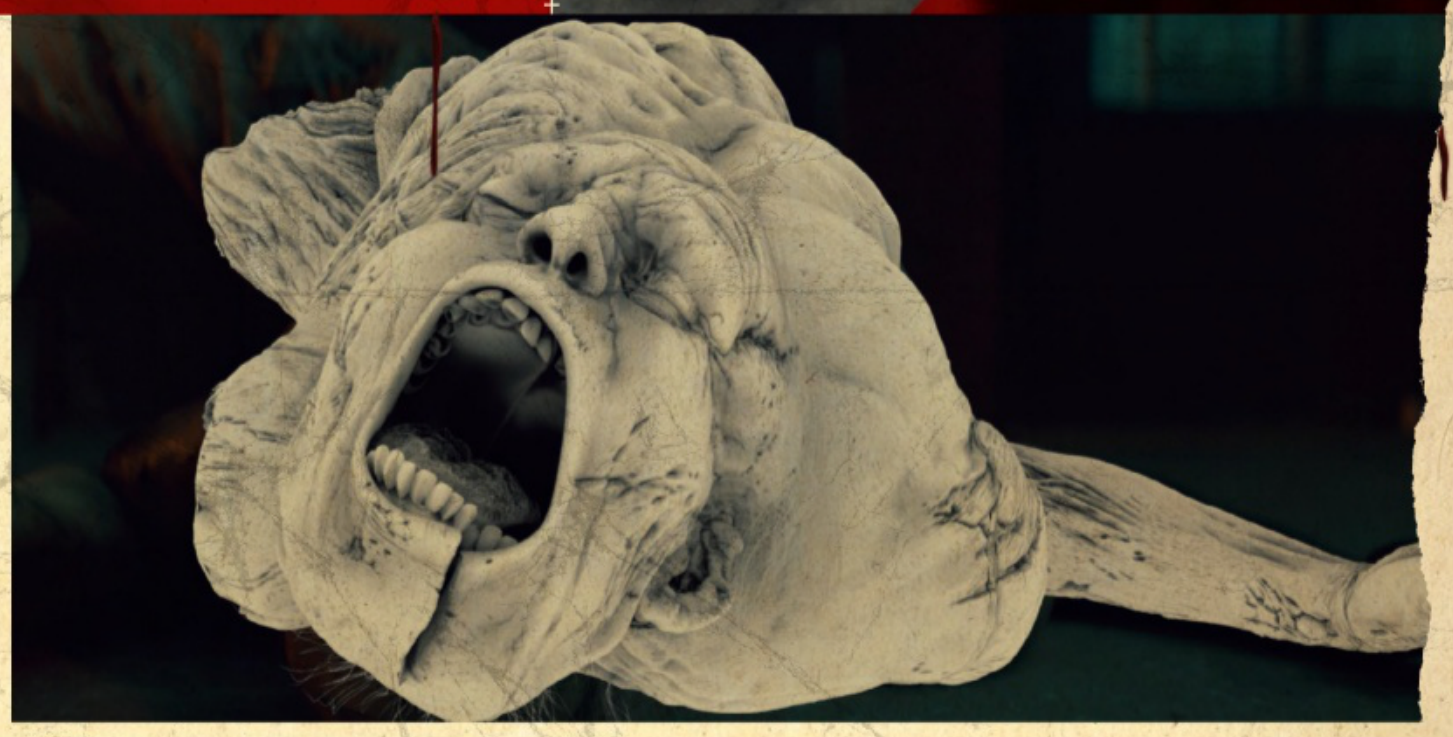
From the moment that Glover and Camaroschi first read the script, they knew that the Jangly Man's ability to rotate his head almost 360 degrees would be their biggest challenge. The team at

Mr. X had already established a working relationship with Guillermo del Toro through their work on *The Strain* and *The Shape Of Water*

Bottom left: Mr. X were tasked with enhancing the on-set scarecrow prop

Bottom right: A before and after shot of Mr. X's work on the nightmarish Jangly Man





Mr. X had to figure out a way of avoiding a 'candy wrapper effect' as the neck twists in on itself. "To solve that we took a three-step approach," explains Camaroschi.

Mr. X's rigging team first had to develop a system that allowed the neck to twist with minimal 'candy wrapping'. "Our animators would then push this to its limits to meet the director's vision," Camaroschi adds. Once the animation was approved, it would go to the CFX department, who used Ziva to maintain as much volume and anatomical accuracy as possible.

"After that, we export the alembic caches and pass it to our creature artists who sculpted the neck to further refine the look," says Camaroschi. "Our asset also had to match the practical one in terms of look from the head down, as the point where we had to take over the practical was different each time. This meant our asset had to seam up to any given part of our actor in plate."

The team scanned the practical Jangly Man in-house, as well as taking multiple photo surveys for texture reference. Camaroschi adds: "We used everything at our disposal to ensure that the practical and digital were indistinguishable."

TERRIFYING TRANSFORMATION

For *Scary Stories To Tell In The Dark*, the studio was also responsible for creating a horrific fate for the character of Tommy, who is transformed into a scarecrow, in a sequence that involved several complex visual effects shots.

Glover recounts: "We started by selecting some key frames and painting them over to set the amount his face would be drying and cracking across the shots, as well as how much hay would be coming out and from where." The team modelled an asset to use for tracking and match-moving Tommy's movements, and a hero asset to replace his face and hands. The team also hand animated all the hay that pushes itself out of Tommy's body. "We tried some simulations, but to really art direct each individual piece, hero animation was the best way," adds Glover. "We rendered some supporting FX elements for smaller debris, dirt and dust, before our compositor put it all together."

Mr. X's matchmove asset was sculpted based on photos of Austin Abrams, the actor that played Tommy. Camaroschi adds: "When we first started the film, all we needed was to make hay come out of his mouth, nose, ears and hands. For that, we did not require an

> "WE KNOW WE HAVE DONE OUR JOB WELL IF THE AUDIENCE LEAVES THINKING THERE WERE NO VFX"
>
> **Cristian Camaroschi, CG supervisor, Mr. X**

A team of around 240 people worked to create 361 effects shots for Mr. X's work on *Scary Stories To Tell In The Dark*

NEVER MIND THE BUDGET

VFX ARTISTS DISCUSS HOW THEY NAVIGATE THE BUDGETARY CONSTRAINTS OFTEN FOUND IN HORROR CINEMA

"We cannot lie that horror movies need a lot more imagination to keep the budget low," says VFX supervisor at Rodeo FX, Thomas Montminy-Brodeur. "Knowing that we need to work with a very limited budget, the VFX team need to know exactly what needs to be done through communication with the client before they start work. A VFX team will also always try to find simpler ways to make an effect that reduces the cost as much as possible, without affecting the end result."

For the VFX teams on films like *Scary Stories To Tell In The Dark* and *Pet Sematary*, working under a tight budget is a matter of creativity, not compromise. "I believe we always keep the same level of creativity," adds Damien Hurgon, VFX supervisor at Mr. X, "but the sooner we are involved on a project the more we can offer different approaches and suggestions that will fit the budget without altering the original vision."

Sergei Sarichev, concept artist at Mr. X, adds: "Sometimes having a project with a lower budget doesn't hinder creativity, but the opposite. You constantly find yourself having to solve problems by using new workflows and finding creative ways to get the job done."

› exact likeness of his face." It later transpired that the sequence would involve a transformation, prompting the team to use their asset and its rig to create as tight a matchmove as possible.

"Once we achieved the closest possible results using said asset," Camaroschi continues, "we went frame by frame to make sure the silhouette was matching our actor in each shot. We painted an albedo map based on the photo survey of Harold the scarecrow and sculpted burlap texture into the skin."

With the sequence lit and rendered, the compositing team took the albedo map without lighting and projected it onto the actor's face, keeping the light information in the plate. "We then used the reflection pass of the burlap sculpt to add depth to the newly painted details on the skin," Camaroschi says. "This hybrid method allowed us to pull off the transformation successfully."

CHILLING ENVIRONMENTS

2019 saw Stephen King's chilling novel, *Pet Sematary*, adapted once again for the screen and Mr. X were heavily involved in the production from its offset. "We were contacted during the prep of the project in April 2018 when production was moving to Montreal," VFX supervisor Damien Hurgon tells **3D World**. "They were looking for a local company to supervise both filming and post-production."

Mr. X met with directors Kevin Kölsch and Dennis Widmyer to discuss the creative vision for the film and propose an approach, and the following week it was confirmed they would be working together. "The visual effects had to be discreet," says Hurgon. "The goal was to use practical effects as much as possible." The studio would offer VFX support for any obstacle encountered by the various departments throughout the production.

Much of Mr. X's work on *Pet Sematary* involved digital set extension and environment work that ensured the titular location remained as faithful to Stephen King's original description as possible. "We had to create the environment for everything beyond the animal cemetery," explains Hurgon. "The challenge was to find the right balance between realism and fantasy, maintaining a graphic coherence during the slow progression towards an almost fantastic world."

For the cemetery set, the team were keen to highlight a sense

"THE HORROR GENRE IS A ROLLER COASTER OF EMOTIONS. VFX NEEDS TO HELP THOSE EMOTIONS"

Thomas Montminy-Brodeur, VFX supervisor, Rodeo FX

of isolation and inaccessibility in the environment. "It needed to be located on a rocky hill and rise in the middle of a vast and dark forest," adds Hurgon. "The swamp that the characters have just crossed is below and we can see in the background a more familiar landscape, more like the forests of Maine." Once they had decided on a concept, Mr. X had to adapt their environment to the rest of the scene, using fog and other atmospheric elements that were not present in-camera.

Sergei Sarichev, lead DMP and concept artist, was heavily involved in the creation of the creepy forest environment. "Because the directors wanted a specific mystical and dark feel to this environment, we visualised the general look of the place though several passes of concept artwork," he recalls. "This was done in shot context, focusing on the big establishing views first, many of which we had limited plates for. Once the look and mood of the environment was approved we proceeded to create highly detailed matte paintings that were specifically tailored for each shot and camera angle."

In Sarichev's opinion, making an environment scary once again comes down to the sweet spot between realism and the supernatural, which can be achieved by altering the mood, atmosphere, lighting or any other visual element of a scene. "For *Pet Sematary* we wanted to have the feeling that when you enter the dark forest you're entering a slightly different world," he continues, "it appears to be the same but it is not."

To achieve that look Sarichev and his team experimented with the aesthetic of the trees, changing the way their branches curved and adding additional atmospheric elements that made some areas less visible to the audience. "The idea behind that was to make the viewer wonder what is going on behind those branches," Sarichev explains. "The less you explain visually the more interesting it becomes."

BUILDING TENSION

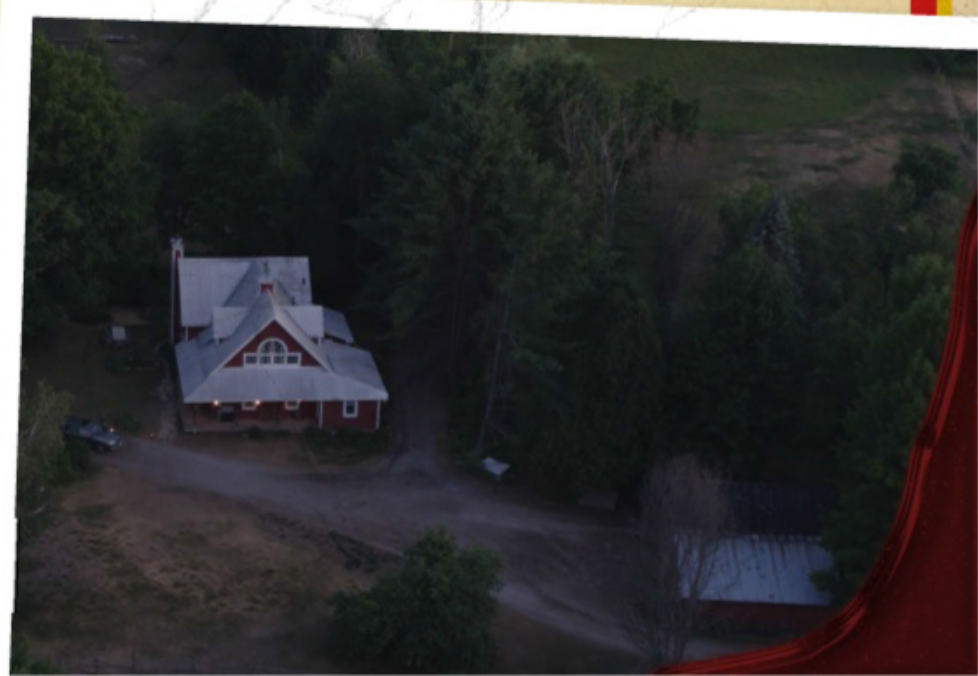
3D World's experts seem to agree that the secret of horror VFX lies in a balance between the believable and the scary. "Building a fantastic world with just enough reality to make it believable and maintain a good balance would be the main challenge," says Hurgon. From Sarichev's perspective, it is about hitting the "visual sweet spot" between a film's visual style and the level of horror the filmmaker wants to depict. He adds: "The visuals have to be impactful and convey emotion, but at the same time, creating over-the-top visuals can easily break the illusion of something looking realistic."

Camaroschi adds that tension, and the immersion that it creates, are key elements of the horror film experience. He continues: "If our VFX were not as real-looking as their prosthetic counterparts, it can very well take the audience out of the moment by having them either question if what they are seeing is real, or even getting the sense that something is off."

"Horror films are not only about realistic and beautiful images, they usually need to bring an emotion to the viewer," says Montminy-Brodeur. "The horror genre is a roller coaster of emotions. In less than ten minutes the audience can go from happy to sad or scared to angry. VFX needs to help those emotions. For example, a sky will be full of contrast with dark clouds if you want to convey danger or fear, compared to a bright sky for a happy mood. VFX needs to be created by the emotion we want to bring during each scene."

Top: Stills showing Tommy's terrifying transformation into a scarecrow

Bottom: Mr. X were responsible for the visual consistency of the environments in *Pet Sematary*, so that viewers couldn't tell they were shot on separate locations



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TALES OF A 3D ANIMATED TV SHOW

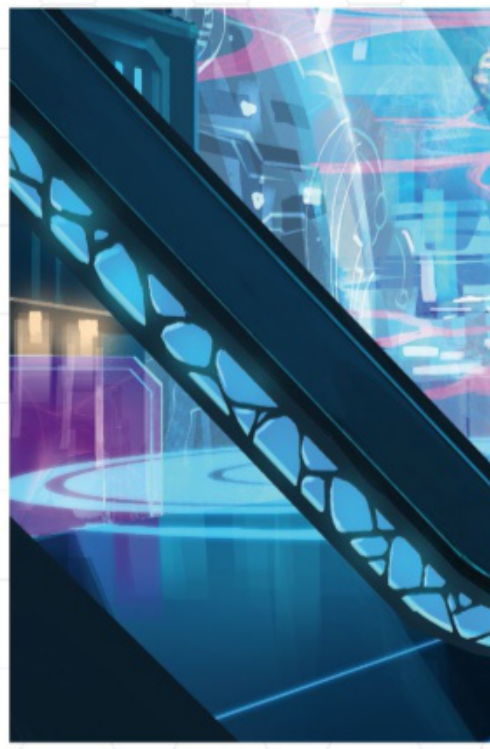
The art and technology behind season 2 of DreamWorks' 3Below: Tales of Arcadia

We are perhaps used to the presence of lush characters and extensive environments in CG animated feature films. But that's not always been the case in animated television series, where multiple episodes, tight deadlines and smaller budgets often drive the final look and feel of the show.

Enter DreamWorks' *3Below: Tales Of Arcadia*, the second instalment of Guillermo del Toro's *Tales Of Arcadia* trilogy (*Trollhunters* and the upcoming *Wizards* series are part of the franchise). For season 2 of *3Below*, the animation production was ramped up to new levels to tell the story of a group of aliens coming into contact with some unlikely earthly friends. 3D World asked two of the creatives behind season 2 how they managed such high production quality. ›

Above: Production design for a bounty hunter fight scene in season 2 of *3Below: Tales Of Arcadia*

Right: Colour key produced for the show's final battle



Far right: Concept frame – the show's makers were afforded more time than usual to consider designs and do look development

"WE HAD GUILLERMO COME IN AND REVIEW ANIMATICS WITH US"

Rodrigo Blaas, executive producer and supervising director

RAMPING THINGS UP

In *3Below*, aliens leave their home planet Akiridion-5 amid local turmoil only to be marooned on Earth. While they are royalty on their world, they are strangers to this new land. They look to return home, but not before making new friends and encountering a swathe of adversaries, including the evil dictator General Val Morando, who has taken over their home planet.

Season 1 had already shown to audiences these characters and plenty of alien encounters. Season 2 revealed more secrets and built up to a thrilling battle against General Morando. That provided a number of major set pieces for the show to include, and a chance for the animation teams to go far beyond what they had done before.

"That's actually the beauty of TV," notes executive producer and supervising director Rodrigo Blaas. "The more you do it at that intensity, the more you understand what the effects of your decisions are. I think the whole team consolidated way more in terms of the decisions that were made while we were preparing the show in the concept stage."

"We didn't have time, say on *Trollhunters*, to test or prep things," adds Blaas. "But the big thing we did, and the most important thing we did, on *3Below* was to do look development while the writing was being done."

DESIGNING THE WORLD

3Below began production like any normal television series. Blaas, del Toro, writers, and members of the art team got together to discuss each episode and the overall story. Blaas, in particular, pinpointed in those meetings certain things he wanted to see happen. "For me

it was the idea of family – when the characters Aja and Krel go into that memory room in episode 10," he says. "Their parents have been in suspended animation without being able to wake up, and they could actually go into the memories of their parents, even before they were born, and see what their history was."

From there, describes Blaas, a different director handled each episode, overseeing the storytelling and animatics process. "We had Guillermo come in and review animatics with us. It turns into these binge-watch, eight-hour sessions where you see one after another. You really get the feeling of the audience seeing the episodes, and being able to say, 'Okay, if it's not working for us in that stage, we know that it's not going to work once you actually make it all and render the whole thing.' We really try to make big decisions there. We have to make them on the fly, because we have to really react fast to go into production."

Production designer Alfonso Blaas and art director Yingjue (Linda) Chen then engaged their teams in character designs and the design of the entire world, right down to the smallest details. "One of the things that was very important for me was trying to find the digital language," notes Rodrigo Blaas. "I started respecting so much more of

MAKE IT GLOW

PHOSPHORESCENCE WAS A KEY PART OF THE CHARACTERS IN 3BELOW, AS CG SUPERVISOR ALEX BRENNAN EXPLAINS

Character glow: A lot of our Arcadian characters have transparent armour. For example, if you look at Vex and if you look at Aja and Krel, they have cores inside of them that were always emitting light. So we constantly had to work around tracking that light emission coming from their core and make sure that they felt alive.

Making them stand out: With alien characters that were blue on blue, it did cause some difficulties in trying to find that exact look that will make them stand out. After multiple tests we figured out a decent balance between physical materials and fantastical materials, fantastical in the sense that they were just something you wouldn't typically see in the normal human world.

Light-based: From their weapons to their powers that they would eventually get and the regeneration process, their memories and the memory cores, everything was really light-based and that was what we used to show life in the show. A lot of the direction that we wanted to maintain actually stems from *Trollhunters*.

Rendering phosphorescence: We used Arnold for rendering. It really helped sell the depth and scale and allowed us to take these characters and make the environment feel a little more real. Arnold was, I think, 100% contributing to the final look and our ability to pull off characters like these for the show.

these submarine movies. Every time in a submarine movie when you see the control room and you see all those screens there, you start realising that everything on them has been designed to be part of the same world. All these decisions about measurements, the sonar, the radar – all these things – are important."

"It's so integral to a sci-fi show," continues Blaas. "It's also very painstaking in terms of design. You're creating a world. You need to really think of all the very small detail elements. Linda did an amazing job, because we wanted to also use CG in the best way. That is, instead of having actual screens, we based all the technology on a light-based technology. The screens were actually floating around them and they could bring them from different devices that they had. I loved the really simple design of those graphics. They were very influenced from the simplicity that you see in *2001: A Space Odyssey*, which beautifully and directly communicates what you need to see on the screen."

ANIMATION PIPELINE

In addition to DreamWorks driving production, *3Below* was crafted by teams at Original Force in China, 88 Pictures in India and CGCG in Taipei. Blaas was particularly impressed at how three different studios could produce something with such a singular vision. "I think that's credit to these amazing studios. They really look at each other's work, and make it a very consistent show in terms of one episode to the other one."

"We were trying to make it so everyone was using the same pool of assets," says Blaas. "We could then communicate the same way, or even pass animation cycles or expressions from one studio to the next. They're all coming from the same space."

CG supervisor Alex Brennan believes a lot of what was produced in this cross-country way on season 2 of *3Below* was made possible with a transformable pipeline. "It was something that allowed us to upgrade as we continued," he says. "The whole *Tales Of Arcadia* production was going to take place over several years, and with software upgrading as fast as it does, we really wanted the ability to adapt as much as we could."

"So," adds Brennan, "in between each season we would take a step back and look at what we could progress on. Sometimes that was as simple as upgrading our rendering. We're rendering now within Autodesk's Arnold, which made it much easier to continue rolling out updates and improving the look and visuals for the show."

With multiple vendors working on the production, DreamWorks allowed for a neutral build state for all of its assets, "meaning that the vendors followed and adhered to a structure that allowed for them to be easily altered through scripts and tools," explains Brennan. "So each studio had their own tools and workflow that we didn't want to hinder. Creating a more neutral platform for them to then ingest these builds and to convert them for their internal toolsets, allowed for vendor studios to come out with much better work."

"With the Maya and Arnold build that we use, nothing's really constrained to software that is not allowed in certain countries," Brennan continues. "It's software and platforms that can be easily adapted if a new studio was to be brought on. It just allows for easy manipulation of what's needed

3Below is the second instalment in the *Tales Of Arcadia* trilogy that also includes the previously released *Trollhunters* and the upcoming *Wizards* series

The show was produced by several studios across the globe, with DreamWorks Animation overseeing story production and consistency across the vendors

FROM CONCEPT TO FINAL

BREAKING DOWN A SINGLE SHOT FROM 3BELOW: TALES OF ARCADIA

1 CONCEPT

For this scene, a showdown with the evil General Morando, artists first composed a painterly image. Concept artwork like this informs other artists down the CG production pipeline how the final composition, colour and general feel of the sequence should be.

2 LAYOUT

This is the stage where early CG models with no real textures or lighting can be placed – and moved – in the scene to match the concept frames. Again, it gives artists a chance to test composition and ensure that the right assets have been built for the sequence.

to be used in the show so that each studio can essentially just bounce off of that and platform the outcome to another level."

Blaas, too, praises the pipeline. He remembers a time when most animated television series were rendered with Mental Ray, but he actually had early experience with Arnold since the late 1990s. "I've seen it grow through time," he says. "When they told me about making a TV show, the first thing I did was call [Arnold founder] Marcos Fajardo and say, 'You have to help me. We have to make this show in Arnold. I know that this is going to make a big difference if we use that renderer.'"

"I think we chose it before it was becoming standard," adds Blaas. "For TV, we had to test a lot of things. I think that decision paid off a lot in *3Below*, because one of the things that I realised in *Trollhunters* was how beautiful emissive lights were when we used it for the eyes of our characters. And in *3Below*, one of the ideas was to actually push that even more and make it part of the objects, part of the weapons, part of the ships – they are often light-based. And so they are actually emissive practical lights in the shot."

The emissive lights – which are part of the glowing and phosphorescent nature of the design of the show – invoked some intense conversations within the design teams about things like different shades and hues of cyan.

Recalls Blaas: "We were always saying, 'Is that really cyan, or is it a different cyan?' It was all about consistency. It became very monochromatic because we wanted that Akiridion planet to be cyan. You have to really have those little increments to be able to distinguish different objects in the frame. That is where I think Arnold came very strongly and handy, because you could actually create an initial mesh light in Arnold and it would affect the skin of the characters. It would really look beautiful in the frame."

MEMORABLE MOMENTS

One of Brennan's favourite sequences in season 2 is the finale where the heroes face down a now giant General Morando. The challenge here was that the dictator's scale had increased dramatically, meaning a greater camera field was required.

Above: The production renderer Arnold proved invaluable for shiny surfaces, reflections and the glow from the characters

"THE SEASON 2 FINALE WAS DEFINITELY OUR PROUDEST MOMENT"

Alex Brennan, CG supervisor

Left: The *3Below* characters, which include extraterrestrials and humans, embark on a mission together

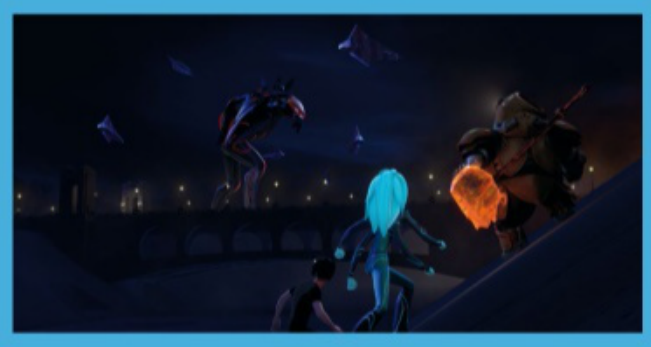
"Because of that," says Brennan, "we then had to think outside the box and start re-visiting some of our environments to make sure that not only would his scale hold up, but that our normal average character scale would hold up for those environment sets as well. Then on top of that element, we also brought in his powers where he's super-charged. Everybody put their foot down and really pushed into place everything that needed to be there to finally wrap up the show on a strong solid note. I would say the season 2 finale was definitely our proudest moment."

3 ANIMATION

With wireframe or grey-shaded rigged models, animators bring the performances of the characters and vehicles to life, also with the aid of moving cameras. Often animators will film themselves with live action videos (LAVs) that can then be replicated in the scene.

4 LIGHTING

It's during the lighting stage where elements are lit and rendered (in Arnold) to properly represent the setting. Light from the moon, from spaceship blasts and from city street lights is represented here, along with the show's classic 'neon' or phosphorescent look.



5 FX

This particular sequence involves significant spaceship laser blasts, which were generated separately to the main animation. Other effects included explosions, rain, sparks, lightning – pretty much anything that represented particles, fluids or fire in the scene.

PART 4 / 5

milk: TACKLING FX CHALLENGES

3D World's special access to Milk VFX continues with an inside look at the FX department

What happens when a visual effects studio needs to generate natural phenomena – things like fire, smoke, water and ice? Or when it has to destroy something into a million different pieces?

Those kinds of things are the domain of a studio's FX department. At Milk VFX, that work is largely handled in SideFX's Houdini by a group of skilled artists. Here, as part of **3D World**'s deep dive into Milk's process, particularly on the series *Good Omens*, the FX team share their insights into how they approach FX simulations.

ALL THE FIRE

In *Good Omens* – which is the Amazon Prime/BBC miniseries based on the 1990 novel by Terry Pratchett and Neil Gaiman – Milk VFX's largest simulation challenge was fire, seen in several incarnations. There was the 'flaming' Bentley, swords and buildings that were on fire, and a wall of fire that at one point surrounds London. To simulate fire, and other FX, Milk has established its workflow around Houdini. It was in this tool that the team had to work out various levels of fire 'movement'.

For example, the flaming Bentley evidenced intensive flames whether it was in motion or not. "It's the movement, the speed of movement that makes that kind of work hard," describes Milk VFX head of effects James Reid. "It's always hard to deal with fast-moving, fiery objects. It resulted in some slow simulations with lots of sub-steps between frames to cope with the amount of movement that you get between those frames, so we had to break it down to little sub-samples and then scale back the amount of movement."

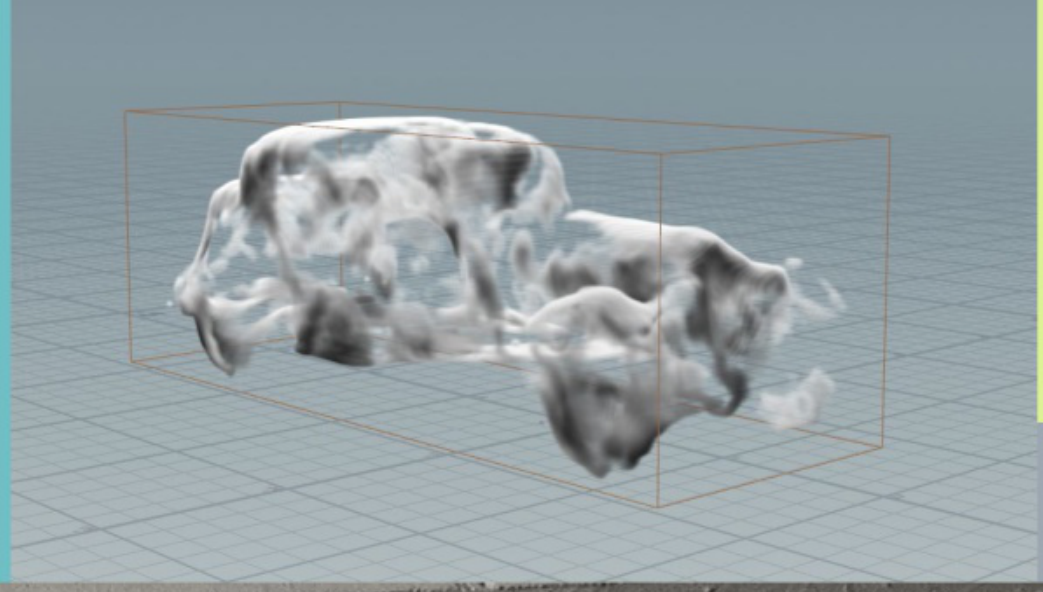
"So, if your Bentley whizzes from point A to B in your shot," he continues, "it only goes 10 per cent of that movement in your sim, in that much more controlled environment, and then you put that movement back on at the end, post-sim. However, you can't do it too much, because then it looks like you've kind of bolted this fire simulation onto the car."

Reid adds that artists at Milk had to keep as much of the translation and rocking motion on the car as possible, so that the fire looked like it was responding to that. "We did that by having some counter forces pushing back onto the car, so the fire pushes over the bonnet, for example. It got around the other problem where you would be emitting a fuel source from the car, and then on the next frame, as the car moves into that fuel source, it kind of just 'deletes' it out, and then you just get it putting its own fire out as it moves through itself." ›

Right: A view inside Milk VFX's studio. So many departments make up the visual effects house, including FX

Top (middle): In Houdini, artists set up interesting noise patterns for the flaming Bentley

Bottom (right): Satan emerges from the underground. The FX department would match the character animation with smoke, debris and other simulations



Above: One of the major tasks of the FX department for *Good Omens* included various views of the flaming Bentley

Right: Other fire simulations were also required for the series, such as for the demise of the bookshop

"IT'S THE SPEED OF MOVEMENT THAT MAKES THE WORK HARD"

James Reid, head of effects, Milk VFX

Meanwhile, another fire simulation task for *Good Omens* included flaming swords, which had to exhibit fiery movement but contained within the length of the sword. "It was a similar challenge with the Bentley in terms of not taking too much movement off the swords," says Reid.

"A little trick we came up with, to get the 'flickerness' right and not make it look too watery, was to increase the timescale in the sim and run a turbulent noise pattern through the flames in the direction the flames were licking. This would exaggerate the right kind of flickery movement. It made it feel a lot more lively, and less liquidy."

"Rendering with motion blur was important for that kind of fast-moving fire as well, which sounds obvious, but we don't always render our volumes," continues Reid. "You don't always need to render volumes with motion blur. In fact, sometimes it just knocks out the detail when you do. But rendering these defined fiery volumes with motion blur was very useful."

THE RISE OF SATAN

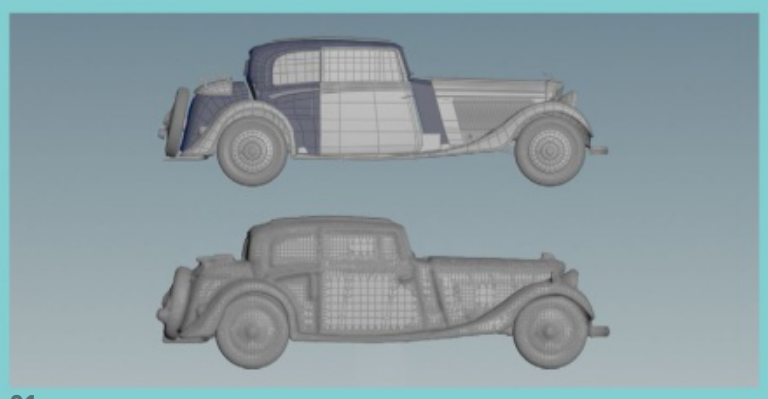
A show about heaven and hell also included, not surprisingly, the presence of Satan. He was a large demonic creature that breaks through from underneath the Earth's surface. The ground and debris that breaks up was achieved with Houdini simulations.

"We started that in a very methodical way, saying, 'Well, we start with the ground, that's the biggest thing. You've got this animated creature, so it has to push through the ground. So we'll get the rigid bodies in place, so that defined how it all fractures up," outlines Reid. "Then we looked at, what are the materials and the layers of the ground? You might have a top layer of tarmac and then a more earthy-type layer underneath, so you define that in the shapes which are fracturing."

The team would run an FX sim with the animation to see the result, and then add in volume simulations on top. There were

BURNING A BENTLEY IN HOUDINI

MILK'S FX TEAM SERVES UP A STEP-BY-STEP SHOWING HOW THEY SIMULATED THE FIERY BENTLEY FROM GOOD OMENS, AND THINGS YOU SHOULD CONSIDER IF TRYING SOMETHING SIMILAR



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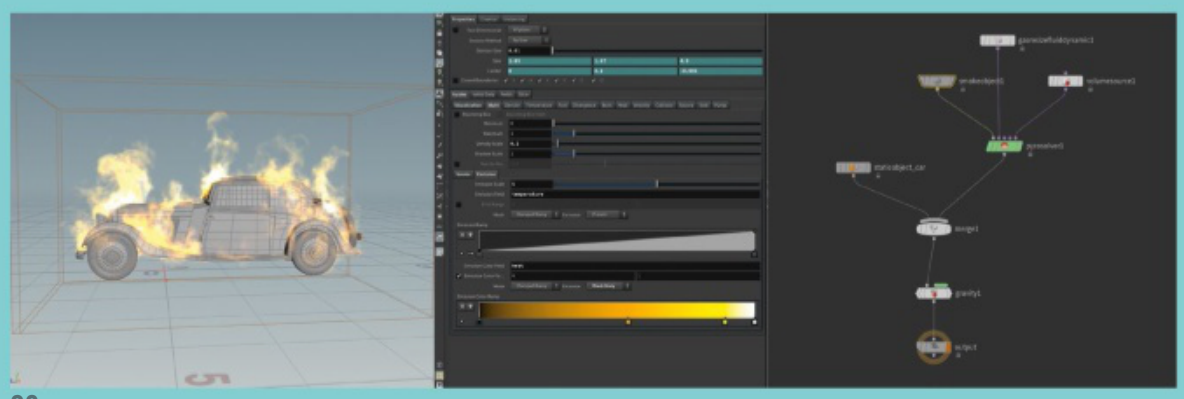

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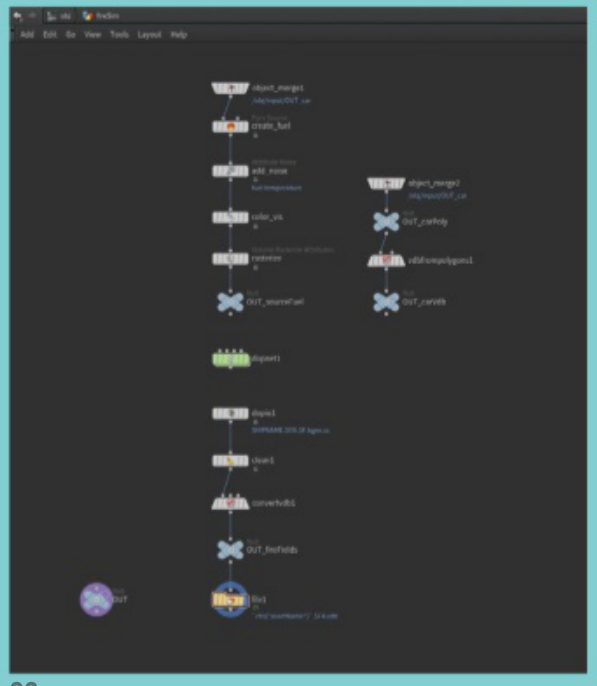


02

04

1. CREATE THE SOURCE

Before you jump into your fire simulation inside Houdini, it is important to consider what you are setting on fire. If you are working with an animated object you should check that the geometry interpolates correctly on sub-frames. Also, consider creating lower-resolution proxies for a more scrubbable timeline, or build closed-surface objects for better volume collisions.

Next, spend time using noise patterns to craft interesting detail and break up a fuel (and temperature) source for fire, or density source for smoke sims. Experiment with the frequency of noise and speed of movement through the source in order to avoid over-saturation of areas that can create blobby or explosive results.

2. INITIAL DYNAMICS SETUP

Bring your source volumes and collision objects into DOPs. The combustion model can be a little daunting to manipulate due to the number of controls, so it is sometimes useful to click shelf buttons (such as smokeless flames) to get an idea of ballpark parameter values. Keep your scene as readable as possible; working in a SOP-level dopnet often helps this as the sourcing, sim-ing, and exporting is kept in the same place.

Set up your visualisation fields and colour ramps in the Smoke Object DOP, with a view to dialling in values for emission scale and fitting the colour ramp later. Link your source resolution to your simulation resolution and consider creating simple expressions to link initial bounds to that of the source (along with the use of a dynamic resize DOP).

3. IMPORTANT SOLVER PARAMETERS

Adjust parameters in the pyro solver one by one using low-resolution settings to keep the sim responsive to work with. Key parameter changes for fire might be to reduce temperature diffusion for sharper flames, increase timescale for faster flickering, and add some shredding to exaggerate the streaky shapes. Adjusting the gas released and flame height values will help define how aggressively the fire expands and rises. It is likely that the frequency and speed of movement of the noise in the source volumes will need some tweaking at this stage to dial in the behaviour of the fire more closely. Save regularly and be prepared to go back to default or shelf values if you suddenly find yourself moving too far from the desired look!

4. BUILD EFFICIENT EXPORTS

Importing the fields back into SOPs below the dopnet continues to keep things simple to read. Volume data can be massive so it is important to think carefully about which fields will be needed. Essential fields will be those that are referred to in your visualisation (temperature and heat for smokeless flames) and should be converted to VDB to make use of the sparse data format, which deactivates voxels that do not hold useful information.

Motion blur is not always recommended when rendering volumes as it can have the effect of blurring desirable features, however when it is deemed necessary it is worth downsampling and masking by a density or temperature field for greater efficiency. Our fire had to look like it was always billowing, even if the car was stationary. It was a lot of work!

Above: Artists researched whitecaps, breaking of waves and foam for the simulations needed in *Adrift*

Right: A unique combination of hand-animated waves and Houdini-generated fluids made Milk's storm sequence in *Adrift* possible

"HOUDINI WAS REALLY GREAT FOR *ADRIFT*. I DON'T KNOW HOW YOU'D DO IT IN ANOTHER PACKAGE"

Dominic Carus, senior effects artist, Milk VFX

also fine details like small particles that needed to be emitted as a result of the fracture, plus fire and licks of flame in the hole through which Satan emerges.

Smoke proved to be one of the more challenging aspects of the Satan emerging sequence, as Milk senior effects artist Dominic Carus discusses. "The hardest thing for me was having the smoke move in a way that the shot needed it to, but still maintain the detail. A tricky thing about this shot was how quickly Satan was moving. Usually with a big creature, you want them moving slowly, but he's thrashing about and we needed him to interact with the smoke, and he kind of swipes all the detail away."

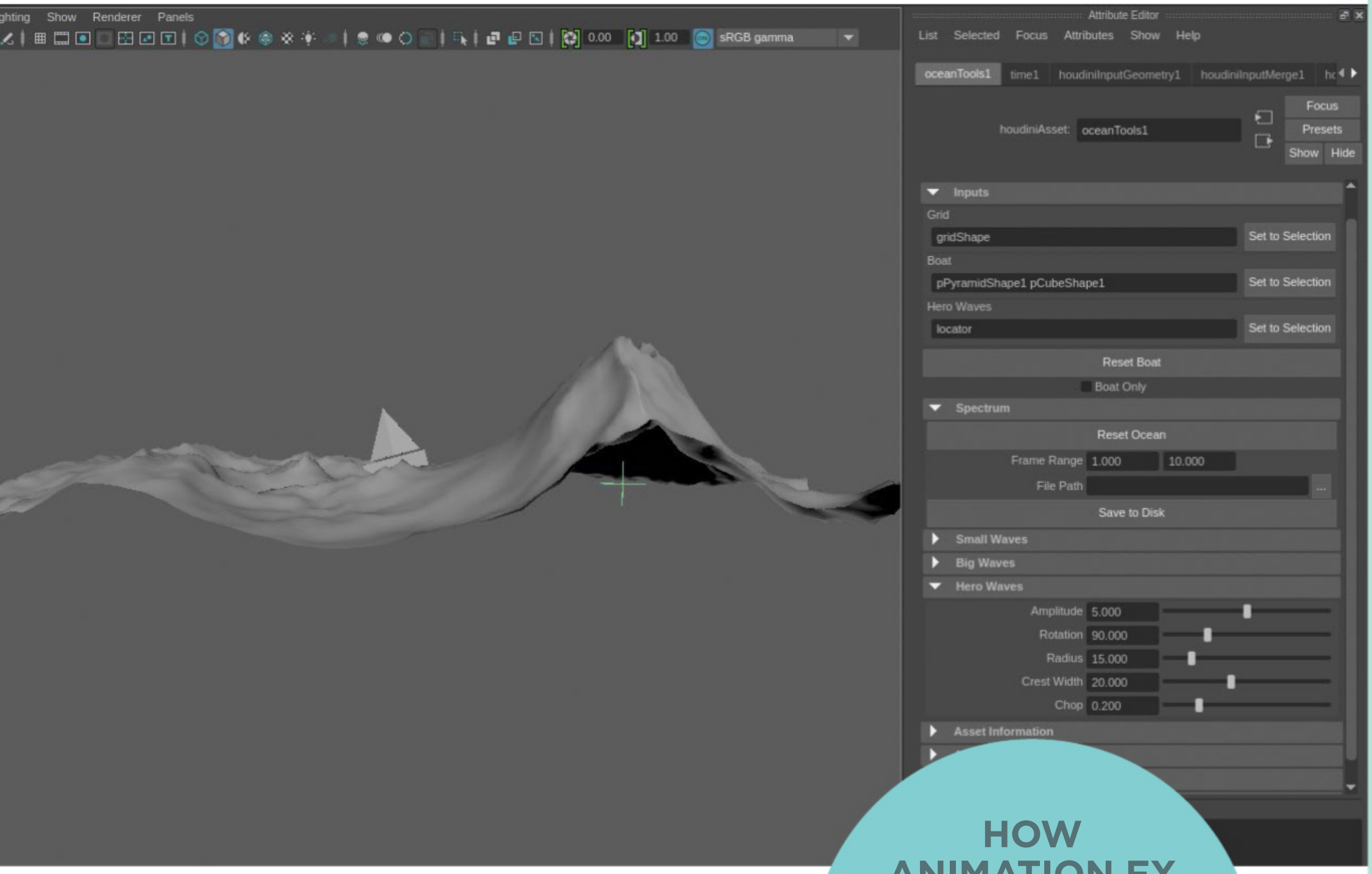
"So we had to come up with a way of imparting some movement to the smoke but still maintaining a bit of the detail that I was trying to build up, because I was trying to have this sort of pyroclastic, broccoli-like structure to the plumes of smoke."

At one point, it was realised as the work on the FX simulations progressed that they had covered up a fair portion of Satan himself. This meant Milk VFX had to bring back the debris and smoke a little so that the face of the creature could be seen appropriately.

"There were a lot of effects elements, particularly in the emergent shots at the start of the sequence, and it was just a case of identifying what they were and layering them all in," outlines Reid. "To get the scale, it was important to get little pieces that were considered important through the sequence, and then to shape the scale of the rocks that fell from the body and the recognisable features of the character. But beyond that, there was the usual rigid body dynamics and dust and fire coming up from beneath, and there was smoke from the fire. The interesting thing about choreographing that first shot was that the camera swept around the creature and it was thought quite early on that the effects were too dominant in the shot, so we had to figure out some changes."

"We had the freedom to pick and delete particular chunks of debris," adds Reid. "When the camera swings around to reveal his face, we did that in time for him to be seen, but in a way that felt natural for this natural phenomena."

"I had to do the same sort of thing with the smoke, actually," reveals Carus. "I had to have regions that were locked around the face where the smoke would part and dissipate. Otherwise it



was like him sitting in the sauna or something and it just blocked all his facial expressions."

MAKING WAVES

Adrift was probably one of Milk VFX's most significant FX shows in recent times. It saw the studio simulate large ocean surfaces, major stormy seas and a series of devastating hero waves. First, artists had to determine the kind of water they needed to simulate.

"The starting point," explains Reid, "was creating the ocean wave landscape. It was packaged up by us in FX as a tool, and handed over to animation/layout, where they could do that in two stages of creating an overall level of storminess of this wave landscape, and then put in some handcrafted big hero waves, which were just moved by hand in Maya. That was all done using Houdini Engine."

This represented just stage one of the process; it was essentially non-simulated deformer-based.

Stage two involved the kind of water that interacted with the boat. "It had to adhere to that surface but then splash with the hull as a FLIP patch around the boat, and that was dealt with in FX," says Reid.

In addition there were ocean-based particles and volumetrics generated that were built on top of whatever the ocean was doing. Boat spray and trails were another kind of water effect. Milk VFX also crafted hero splashes as FLIP setups in Houdini.

"Houdini was really great for *Adrift*," notes Carus. "I don't know how you'd do it in another package. All these effects needed to drive one another. I mean, if you were to start saying, 'Well, I've got to do the volumes in one package, I've got to do the ocean surface in one package, and I've got to do the fluid dynamics, the water, the spray, somewhere else, it would've been a killer, I think."

FYI *Discover more of Milk VFX's work at* **milk-vfx.com**

HOW ANIMATION FX WORK TOGETHER

HOW MILK'S FX AND ANIMATION TEAMS COMBINED FOR THE OCEAN SIMULATIONS IN ADRIFT

The film *Adrift* required rough seas – very rough seas. Milk VFX's shots utilised a Maya and Houdini approach, with Houdini Engine as the bridge, to orchestrate and simulate everything from large waves to ocean spray.

Houdini Engine essentially acts like a plugin to different applications, such as Maya, with artists able to use the procedural node-based approach in the SideFX tool within other tools.

For *Adrift*, Milk VFX relied on a tool for layout and animation of water sims inside of Maya (using Houdini Engine) to help create broad ocean surfaces. The idea was that waves could be 'art-directed' to some degree and also quickly worked out for client feedback, as well as to match what had been filmed for real in the practical photography. Later, the data would be exported to Houdini for final sims.

MALEF

3D World speaks with MPC in London about the studio's animation and visual effects work for Maleficent: Mistress Of Evil

ICENT

TAKES FLIGHT

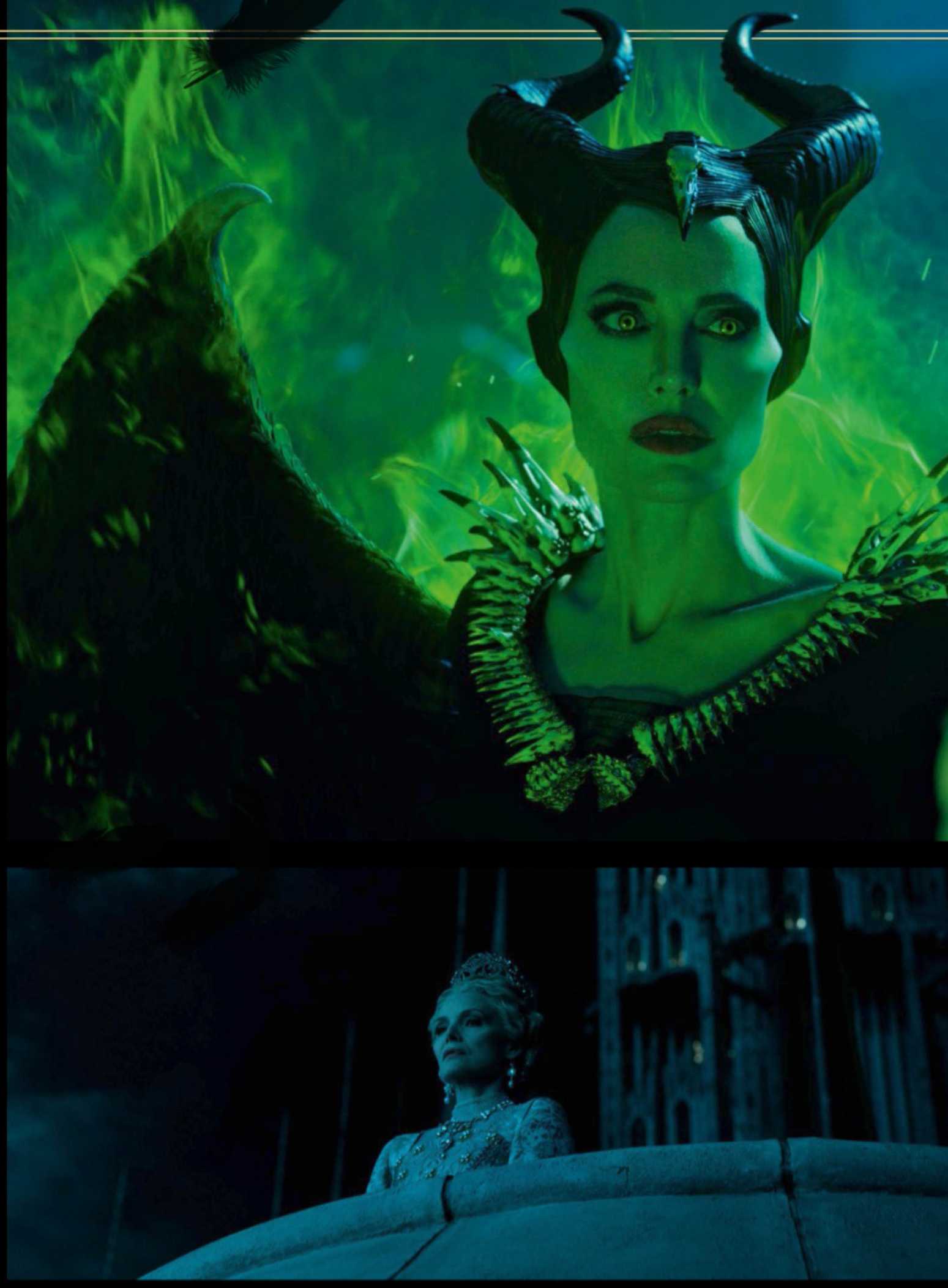
In the grand tradition of storytelling, in the realms of myth and fairytale, the act of being able to take flight has long possessed a resonance and allure, taking characters and audiences beyond the limits of reality and into something unearthly. This image is central to the *Maleficent* movie sensibility.

In the first film, *Maleficent* (2014), a handful of moments saw its title character vault skyward, where she would soar and swoop, rise and fall, with imagery that was invested with a beauty, lyricism and kinetic energy. In the sequel, *Maleficent: Mistress Of Evil*, directed by Joachim Ronning, MPC had the opportunity to build on the work that they created for the original movie.

> "WE BASED MALEFICENT'S WINGS OFF OF EAGLES AND THEIR POWER"
>
> **Seng Lau, animation supervisor**

Speaking with MPC's Jessica Norman, VFX supervisor, and Seng Lau, animation supervisor, the conversation about their work on the new movie begins with them each laying out their respective roles on the project.

Of a key creative responsibility that he had on the movie, Seng Lau explains, "In my role as animation supervisor I am in charge of wings for all of the winged creatures; for their look and feel and physicality." Norman then defines the emphasis of her role, commenting that over about 18 months "I was on the show from preproduction, and also partially during the shoot and then all the way to the end where I was working with the compositing team in Bangalore. Initially, I was working with the asset team, to solve things like how do pipelines for the wings work, how do we



Top: Aurora witnesses Maleficent's fiery, elemental power in this close-up

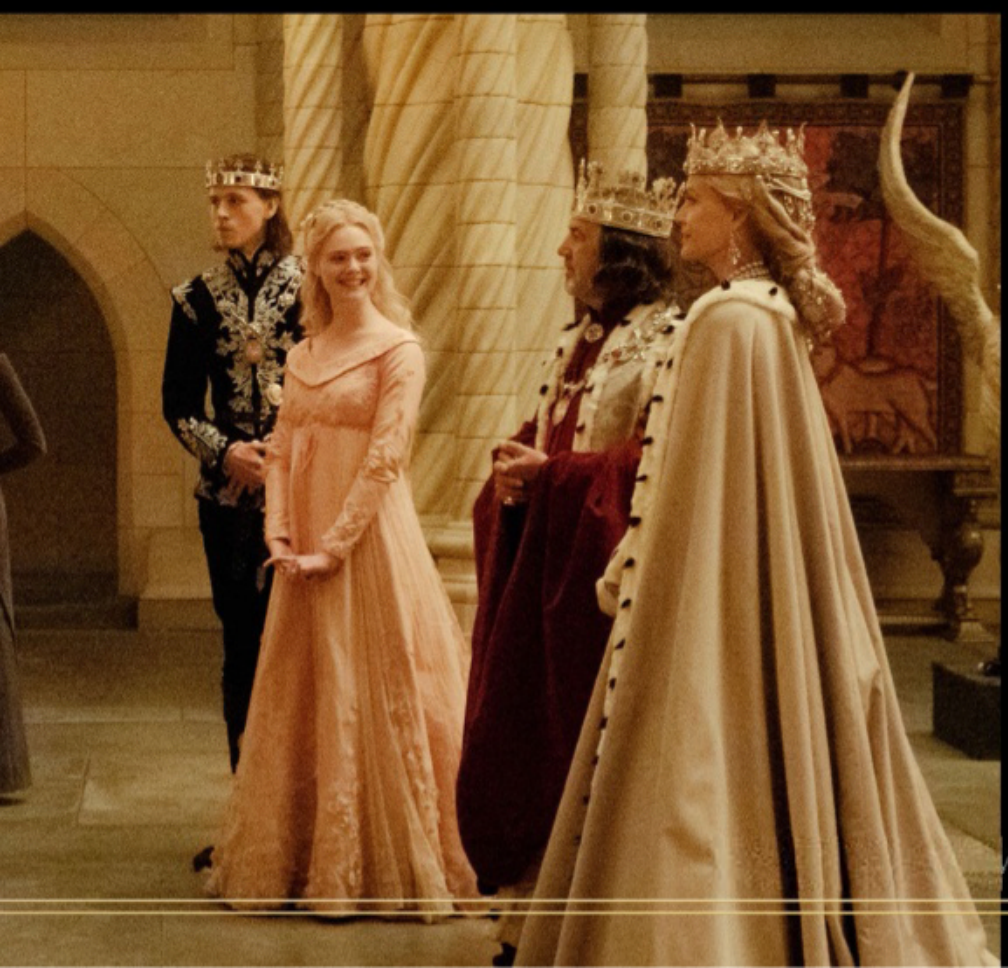
Above: To develop digital environments that would be composited with live action, MPC had a presence on the set, gathering data and a feel for a given space

Above (right): Maleficent's eagle-inspired wing design at full extension

RIGGING FOR FLIGHT

SENG LAU OUTLINES THE RELATIONSHIP BETWEEN RIGGING AND ANIMATION FOR MALEFICENT: MISTRESS OF EVIL

Of the critical relationship between the animation and rigging teams, Seng Lau notes that “the rigging team here was outstanding, as they had to meet the demand of lighting and grooming.” For the detail of winged animals and of individual feathers reacting to a breeze or to the wind, “rigging had a huge challenge. There is a shot in the film that’s set in the nest where you see Maleficent’s naked back: in that shot there’s a lot of work for rigging to do. As far as animation requires, we need the birds with primary, secondary and tertiary feather interaction. On the surface, Maleficent’s wings are like a collapsing arm.”



work with the crowd department and how do we build assets in the most effective way.” Of the crew size, Norman recalls that during her work on the movie, the MPC crew peaked at 1,000 staff working across MPC’s global network of studios. “Shots [were] split across various supervisors and teams in Canada and also the team in Bangalore,” Norman notes. “We sat down and worked out how to break it into sequences and to make sure that we had assets, developing them and sharing things that worked.” Norman also speaks to the opportunities that she and her team had during their work on the film in terms of authoring and shaping the look of the film, noting how occasions arise throughout a project to adjust and inform the ‘authoring’ of particular shots and resolving creative decisions in conversation with the director and client.

“The first *Maleficent* movie was a great-looking film,” Lau observes, and adds that for this sequel project there was an opportunity to develop and realise “a lot more work in detailing in the wings.” In turn, this attention to expressive subtleties informs the development of animated elements comprising Maleficent’s wings. “We always based her wings off of eagles and their power,” Lau recalls. “We

"I CALL THE ARTISTS HERE 'SPECIALISTS' AND I REALLY BELIEVE IN OWNERSHIP: I LIKE ONE ARTIST TO HAVE RESPONSIBILITY FOR A SHOT"

Seng Lau, animation supervisor

› had a clear vision of 'these aren't just wings or a prop' and so we had to have conversations about 'what are the wings doing in each shot?' For example, there was a sequence when Aurora breaks the news that she's engaged and Maleficent's not very happy with that, and so we tried to make the wings become part of the performance and emote in that moment."

Lau goes on to note that "if Maleficent was uncomfortable, for example, but had a stoic face, the wings were an extension of the feeling. That was challenging because acting with wings is such a strange concept." Lau makes an additional point that speaks to the range of visual approaches that inform a creative decision: "Maleficent is a very graphic character and we had lots of conversations about how to frame Maleficent's face, almost like a graphic novel panel."

Our conversation then returns to Norman's focus on the visual effects elements of the film, and she addresses the creative challenge for her team: "The thing that was fun but challenging was that we were doing so many different kinds of things. We had 879 shots with wings; not just the fur, the rendering but also all of the fairy creatures. The guide from the beginning was to look at the first movie and improve from there. We always try to find real things to reference, and so we had tons of different reference for the animal world. It was fun to update the Tree Guards and there were also new characters to make."

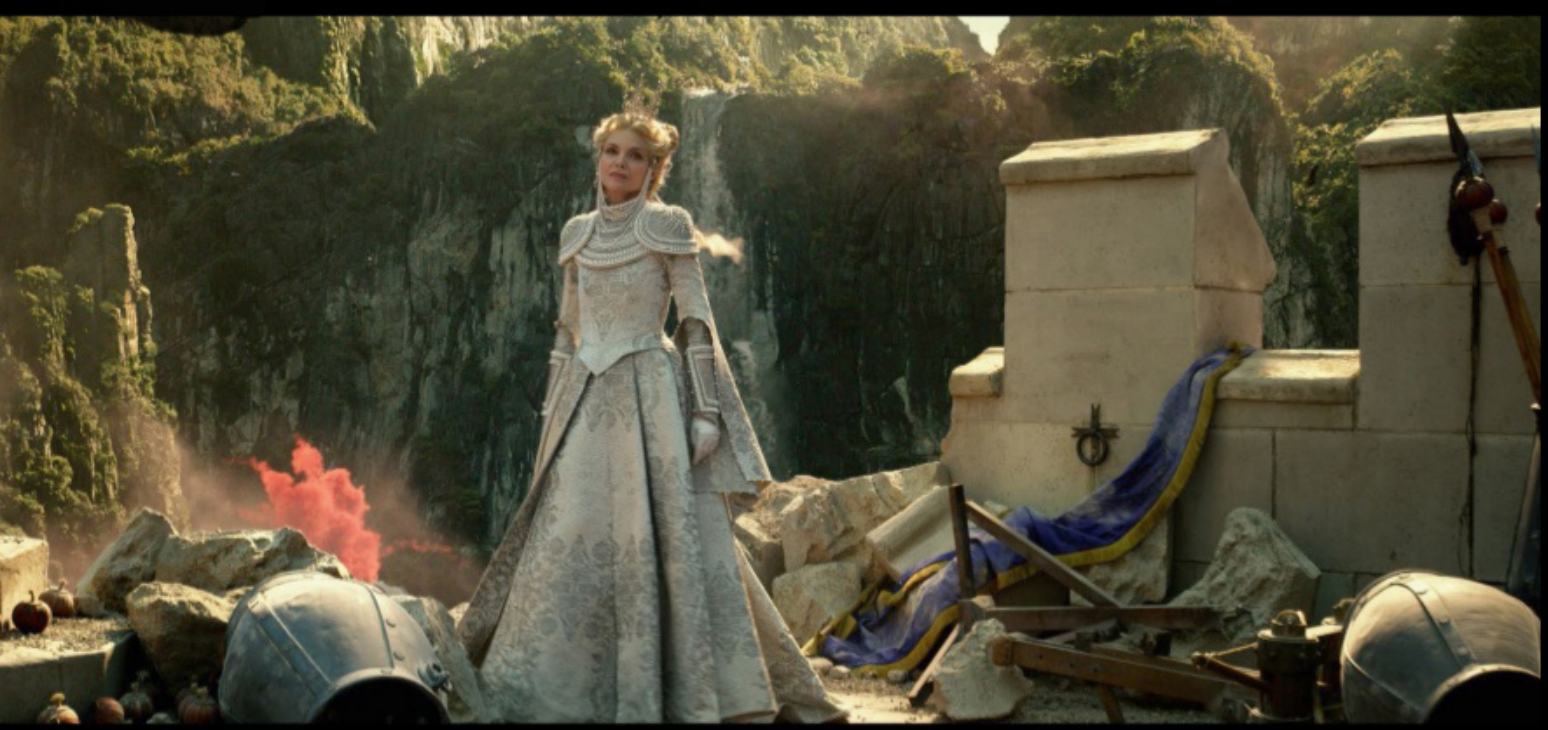
Above: Director Joachim Ronning on the practical forest set with Dakota Fanning

Above (right): In close-up, the subtlety of the texturing and lighting of the animated feathers on Maleficent's wings enhance expression of character

Norman also makes the point that one constant creative issue that she and her team worked with was the creation of believable character movement that might be implied by concept art generated for the project. In turn, Norman's team enhanced the believability of the fantasy with attention paid to the "textural quality in terms of light reactions."

In speaking with Norman and Lau, then, it becomes clear that the work of character and environment realisation is informed by an awareness of visual culture and an understanding of the nuance and subtlety of character building.

For all of its fantasy-genre trappings, Lau addresses the way in which the fanciful designs that characterise the movie are rooted in real-world reference. "In our conversations, we would look at the



concept work that had been done about the anatomy of the fey," he explains. "Every fey had a different look and feel to their wings and so we looked to obvious cues like birds of paradise, jungle birds, and also snowy owl reference."

Lau adds, "For a fey like Borra – the warrior fey, a desert fey as well – the structure of the wings were really more like a condor or a vulture's wings." In this respect, Lau makes the point that Borra contrasted vividly and immediately with the visual design of Maleficent. "With Borra, we were trying to get his movement to be aggressive, but for Maleficent her wings are very graceful." Lau observes that in developing the look of Maleficent's wings for the new movie, there was in fact only relatively minimal reference available in the original film: "It's tricky, because the wings weren't in the first one for that long."

In their work for *Mistress Of Evil*, both Norman and Lau contended with a large volume of work. "The really tricky things were the sheer number of shots," Lau explains. "In a sequence with 20, 30, 40 artists, my job is to get everyone on the same page. It was tricky. I call the artists here 'specialists' and I really believe in ownership: I like one artist to have responsibility for a shot. Everyone creatively needs to be stoked, so I had one animator who took on heavy action, another took on underwater stuff, another for action stuff." In any project, there's a need for the rigging team to engage in an ongoing dialogue ›

PRACTICAL SETS, VIRTUAL SETS

JESSICA NORMAN DISCUSSES THE VALUE OF VFX SUPERVISORS HAVING THE OPPORTUNITY TO WORK ON SET DURING PRODUCTION

"From the production side (principal photography), the crew at Pinewood Studios had an excellent team of data wranglers working, and they knew what we needed to work from. For the duration of the shoot, our wranglers from MPC would go to Pinewood and do additional photography. I would also be on set for additional splinter unit work at Pinewood. Sometimes I needed to walk the set, and that informed the virtual environment build in the computer."

All images courtesy of Disney.

with the animation team so that the riggers are building designs that will allow the animators to do their work with as much nuance and range as possible.

The number of fey to be created and animated in the final battle was a sizable project for the animation and visual effects departments and it prompts Norman to recall how the film required a "huge environment build." She adds that "the castle environment and gardens surrounding it, but also the moors, had the challenge for us of getting all of the characters to live inside that environment, to get that fairytale feeling." While *Maleficent* has a background in the European fairytale tradition of *Sleeping Beauty*, the external environments of the moors that feature in *Mistress Of Evil* were actually informed by images of Chinese and Vietnamese landscapes.

Top: MPC's animation teams took a cue from the aesthetic of graphic-novel panels in terms of framing and positioning Maleficent

> "IT WAS FUN TO WORK WITH DIFFERENT SUPERVISORS ACROSS THE WORLD AND WORK OUT HOW TO MAKE IT ALL CONNECT"
>
> **Jessica Norman, VFX supervisor**

As our conversation begins to draw to a close, Lau offers a piece of important advice for any aspiring and emerging animators. "The important thing is that you need to know that it is attainable and all that it requires is hard work and dedication," he explains. "When you first start out, just keep trying. Have an openness to criticism and feedback and keep continuing to try. People stop trying too early."

Looking back over the creative tests that Norman and her team worked through, she focuses in on the difficulty of ever reaching a point of satisfaction with aesthetic choices. "Part of being creative is that it's hard to say something looks good," she says. However, what Norman enjoys the most is working with the team: "it was fun to work with different supervisors across the world and work out how to make it all connect."

Above: While Maleficent's wing elements emphasised elegance, for Borra the wing design suggested something more primal

FYI *Find out more about MPC's work at* **moving-picture.com**

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Rusty Hazelden
Rusty Hazelden is a visual effects artist, writer, and YouTuber based in Halifax, Nova Scotia. He makes videos on YouTube about movie visual effects techniques.
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PART 1/4

For over 30 years Pixar's RenderMan has been used in the film industry to render movies featuring groundbreaking animation and visual effects.

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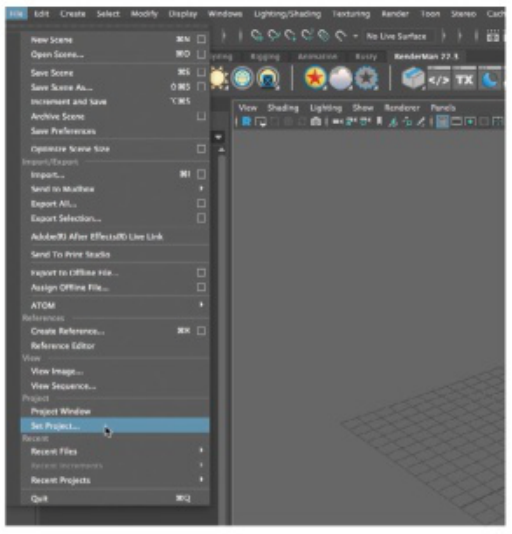

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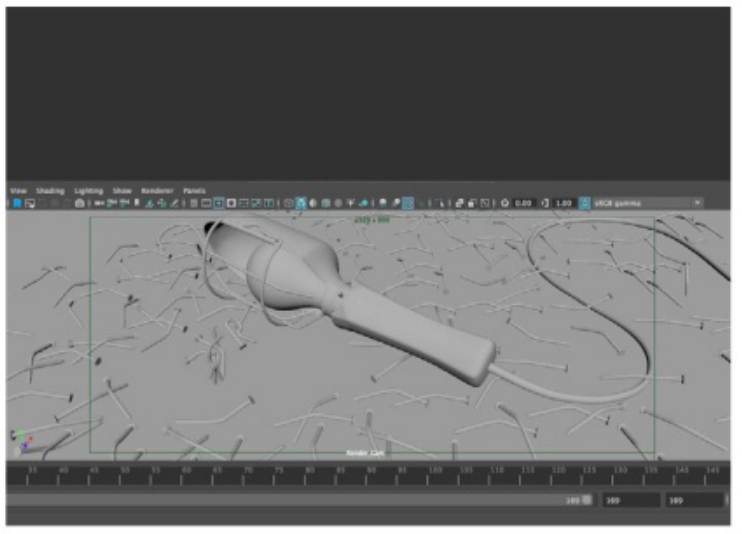

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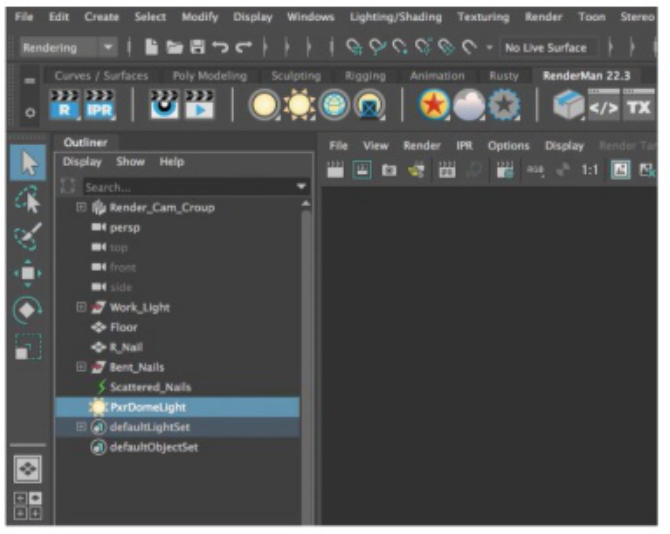


03

01 OPEN THE MAYA SCENE

When you start working on a project in Maya the first thing you need to do is tell it where the project files are located on your hard drive. The Set Project command is used to define the directory where the scene files, models, and textures are stored. Choose the File>Set Project menu item. Select 'The Art of RenderMan Volume 1' project files folder and click Set. Now we can open the Maya scene file that is the starting point for the tutorial. Select File> Open Scene and navigate to 'The Art of RenderMan Volume 1' scenes folder, select the file called 'Chapter_1.ma', and click Open.

02 REVIEW THE ANIMATION

The work light scene consists of several objects and a camera that is animated and moves through the scene. Let's click the Play button and watch the animation. The camera moves in closer on the work light and a bent nail falls down and settles on the ground. The nail's motion was calculated using a dynamic rigid body simulation and baked to keyframes. There are also static nails scattered around the work light and several of them are resting on the cord. Click the Stop button then reset the current time to frame 0.

03 THE RENDERMAN SHELF

This is used to launch renders, add lights, and create materials. Let's start by adding a dome light. Click on the sun icon. By default, the dome light creates illumination throughout the scene that simulates an overcast day. Switch to the Transform node and type -10 in the TranslateY field. This won't change the lighting in the scene, but it makes the viewport a little clearer by moving the PxrDomeLight locator below the floor in the scene.

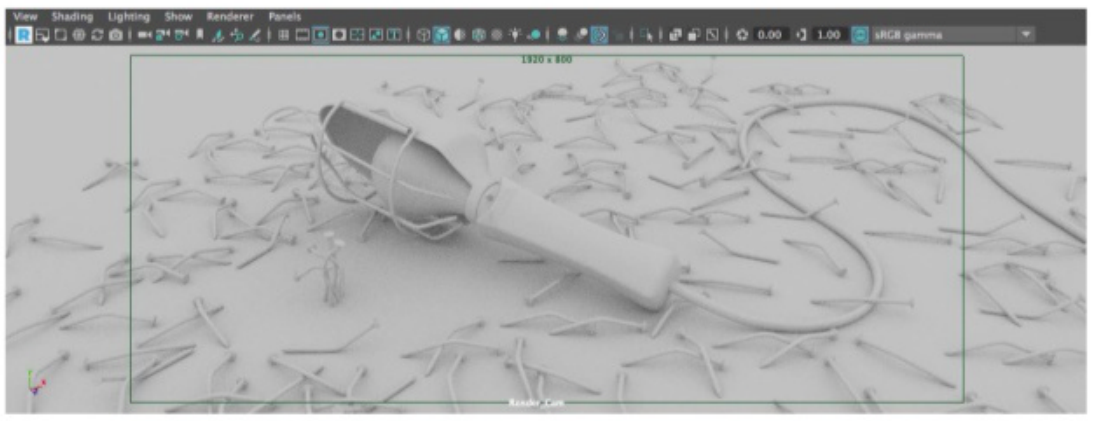
Avoid spaces in file names

When using RenderMan, file names and file paths should not contain any spaces or extended characters. Instead of using spaces in file names use the underscore '_' character. Extended characters to avoid include accented characters found in foreign languages, and Unicode multi-byte characters.

04 RENDERMAN IN THE VIEWPORT

Now that we have a light in the scene, let's enable the viewport rendering mode by clicking the letter R in the viewport. This will start the RenderMan viewport renderer which provides a much more accurate view of the scene lighting. The default Viewport 2.0 renderer in Maya is useful for modelling and animation, but when it comes to lighting and rendering you should enable the RenderMan viewport renderer.

At this point, all of the objects are grey and soft shadows are provided by the dome light. The viewport renderer updates continuously and produces a cleaner image over time.



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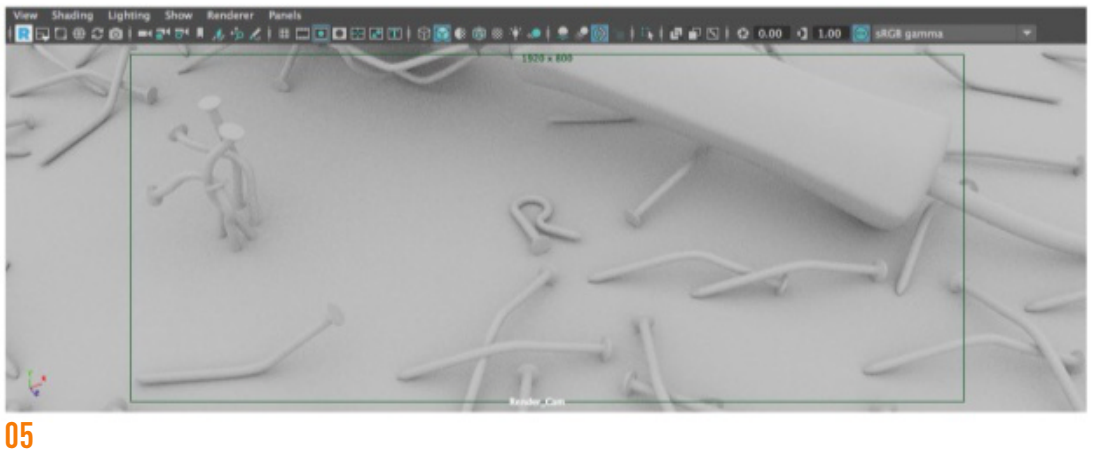

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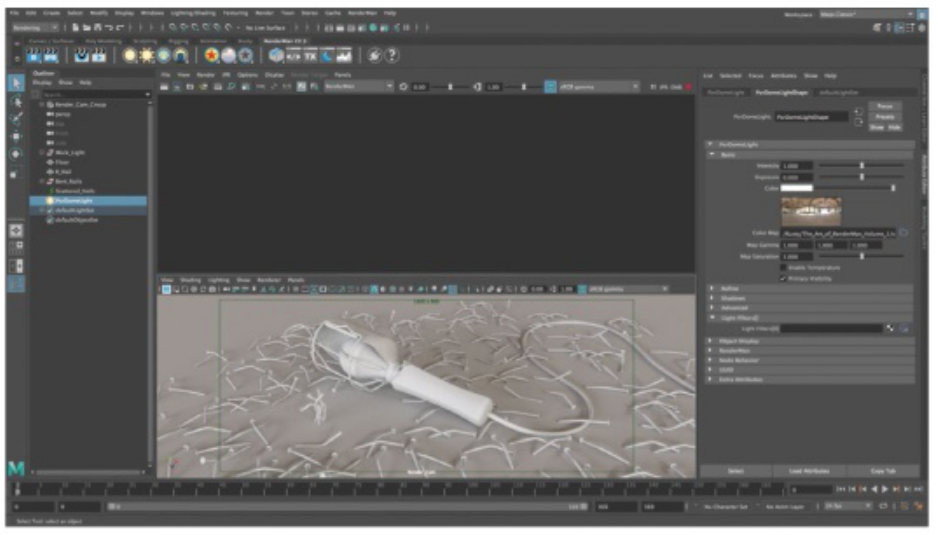
05 ADJUST THE DOME LIGHT

Let's jump to the last frame of the animation in the time slider. Set the current time back to frame 0. Now let's switch to the shape node and adjust the dome light properties. The dome light supports image-based lighting using a panoramic HDR image. In this mode, the lighting will be more realistic and dome lights also provide environmental reflections that will show up on shiny metal objects in the scene.

06 RENDERMAN TEX FILES

Click the folder icon next to the Color Map attribute. Then click on the source images folder and select 'Environment.tex' and click Open. RenderMan supports texture maps in several common formats including PNG, TIFF and EXR. When these kinds of images are loaded in RenderMan the images are converted automatically into an internal file format called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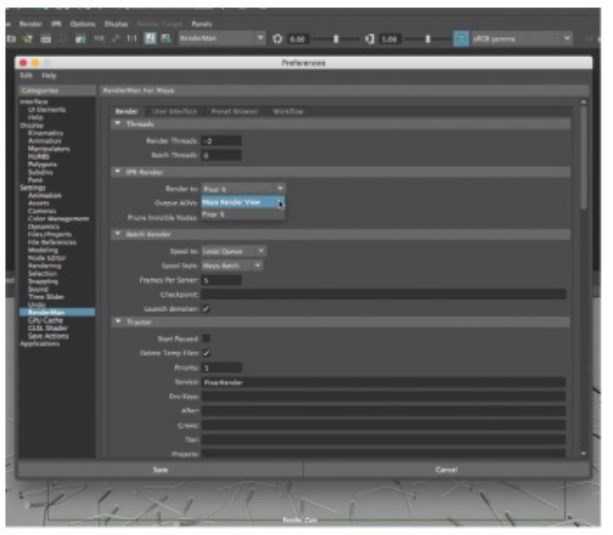
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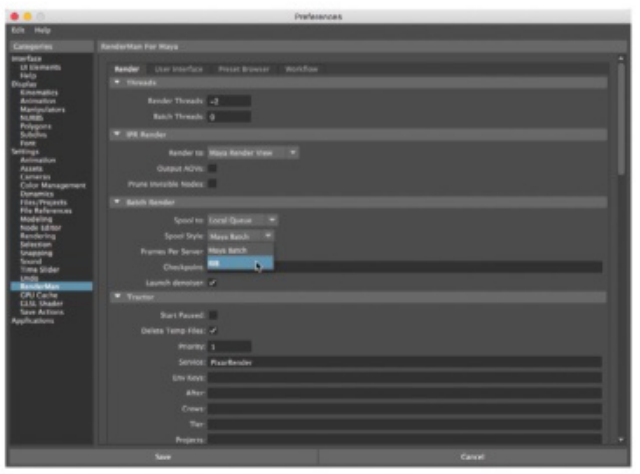
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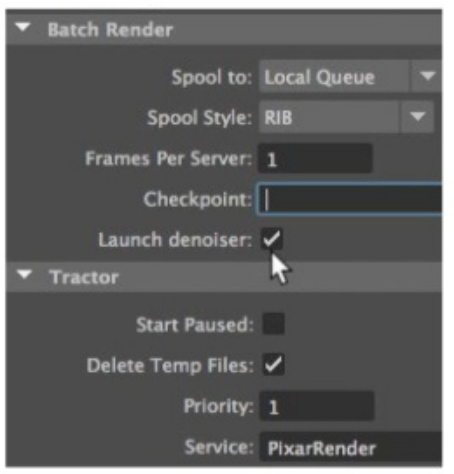

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TEX files. The conversion process happens in the background when you start a new render. In this tutorial, all of the textures have already been converted into the TEX format and are ready to go.

07 ENHANCE THE LIGHTING

With the environment texture loaded, the scene has more realistic lighting and the shadows are more detailed. Let's turn off the Primary Visibility checkbox so the environment won't be visible in the background of our renders. We are also going to turn off the dome light's visibility in the viewport by expanding the Object Display> Drawing Overrides section in the Attribute Editor. Turn on the Enable Overrides checkbox and then uncheck Texturing. Click the R icon to stop the viewport render.

08 RENDERMAN ON LAPTOPS

RenderMan ships with a custom render view called Pixar Image Tool or "it". Image Tool works well on large monitors but it can be challenging using "it" on smaller screens like those found on laptops. Let's customise this using the RenderMan Preferences menu. To send rendered images to the Maya Render View, switch the IPR Render 'Render to' setting from 'Pixar it' to 'Maya Render View'. With this small change, RenderMan will now send rendered images to the built-in Maya Render View rather than "it", and our screen layout will be more compact.

09 LOCAL QUEUE

We're going to render the final animation using the RenderMan Local Queue with RIB files, so make sure 'Spool to' is set to 'Local Queue', change the 'Spool Style' to 'RIB', and set the 'Frames Per Server' to 1. These settings will allow us to manage the batch render on our computer using the RenderMan Local Queue program. It will take a series of RIB files (that represent the scene data exported from Maya) and render them one frame at a time until the entire animation is complete.

10 THE DENOISER

RenderMan includes a useful feature called a denoiser that makes it possible to slash render times. Make sure the 'Launch denoiser' checkbox is enabled in the Batch Render preferences. By enabling this checkbox, Local Queue will run the RenderMan denoiser on animated sequences after the batch render is complete. Now click the Save button.

Help in just one click

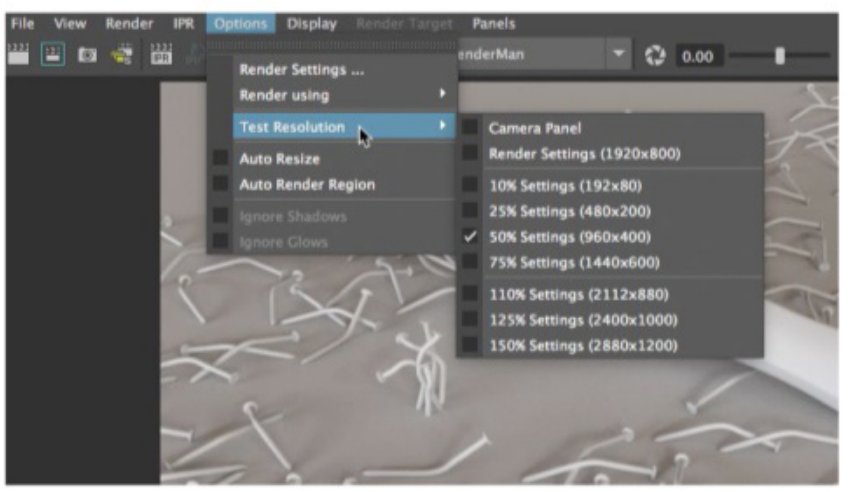
RenderMan includes comprehensive online documentation filled with all sorts of detailed information. Simply click on the question mark icon in the RenderMan shelf and your web browser will open up and take you to the RenderMan for Maya documentation.

11 MAYA RENDER VIEW

Now that we have set RenderMan to display rendered images in the Maya Render View, let's click on the 'Clapboard' icon with the R logo to start a new render. Once the render begins you can watch the image refine in the Render View and a progress bar is shown at the bottom of the window. The image refines progressively over time until the final image quality is reached.

12 SPEED UP YOUR RENDERS

We're rendering using a test resolution of 50% in the Maya Render View. This means the images we create will be at 50% of the final render resolution. If you want even faster test renders, simply go to the options menu and select a lower test resolution like



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25%. The test resolution setting only affects images rendered in the Maya Render View. Full-resolution renders will still be produced when running batch render jobs.

13 RENDERMAN MATERIALS

We're going to create a red plastic material for the light switch. In the Outliner click the plus sign next to the Work_Light object. Select the Switch and then click on the Pixar surface material icon in the RenderMan shelf to assign a new material. The PxrSurface material is a general-purpose shader that can be used to simulate a wide variety of materials.

14 THE DIFFUSE LOBE

Just about everything you render in RenderMan will likely use the PxrSurface material. There are a few exceptions such as volumes and hair, which each have dedicated surface materials. To get the look of red plastic we're going to adjust several material attributes, which are also known as lobes. The Diffuse lobe describes the base colour of a material, and the Primary Specular lobe describes how reflective it is. Let's start by clicking on the Diffuse 'Color' swatch. Then click the red colour preset in the colour picker.

15 INTERACTIVE PREVIEW RENDERING

Next, we're going to change to the perspective camera so we can get a closer look at the switch on the work light handle. Select the Switch object in the Outliner and press the F key to zoom in on it. Adjust the view so the switch is nicely framed in the middle of the viewport. Right-click on the IPR 'Clapboard' icon in the RenderMan shelf, and select the perspective camera. This will launch a RenderMan interactive preview render in the Maya Render View. The IPR render will continuously update the image as we make changes to the PxrSurface material.

14

RenderMan Playblasts

Click the RenderMan Playblast viewport icon to quickly launch a Playblast render. A RenderMan Playblast is a great way to preview an animated sequence in Maya complete with accurate lighting and detailed textures.

16 SHINY RED PLASTIC

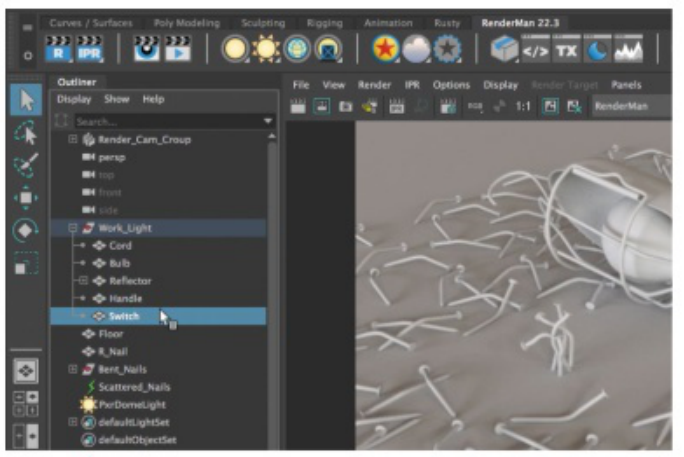
Let's make the red material appear more like plastic by adding a bit of reflectivity using the Primary Specular lobe. There are two Specular Fresnel Modes. The Artistic mode can be used to create stylised materials that defy the laws of physics, and the Physical mode is physically accurate. Let's switch to the Physical mode.

17 THE PRIMARY SPECULAR LOBE

To complete the look of a shiny red plastic material we need to define the specular colour. Traditionally, plastic materials have a white specular colour. Set the Edge Color attribute to white by dragging the slider all the way to the right. Now we have a nice shiny red plastic material. The last step when creating a new surface material is to give it a unique name. Let's rename this Pixar surface material to 'Switch_Material'.

18 THE HANDLE MATERIAL

Let's create a black material for the work light handle. Select the Handle object in the Outliner, and click on the Pixar surface material icon in the RenderMan shelf to create a new material. Let's rename it to 'Handle_Material'. Drag the Diffuse 'Color' slider all the way to the left to change the colour to black. At this point, the handle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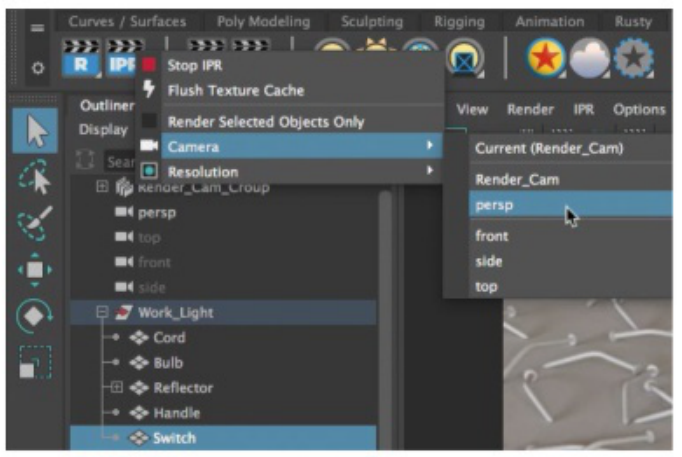

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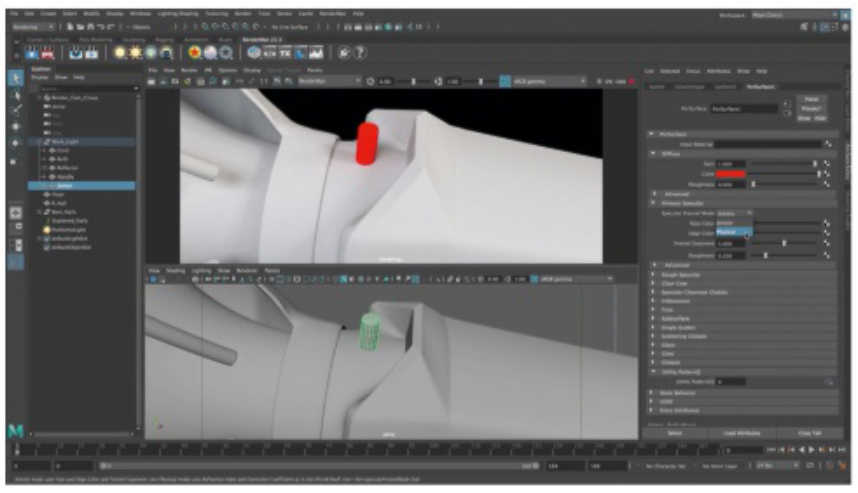
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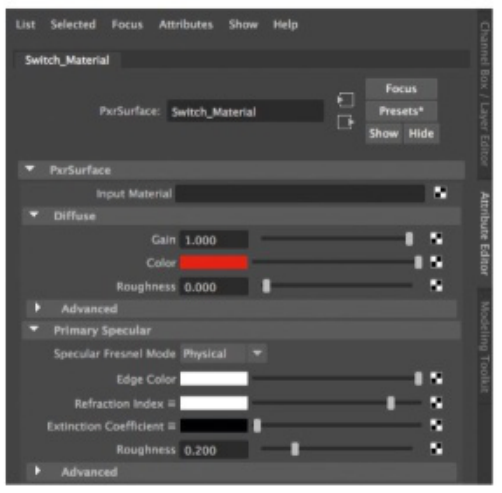

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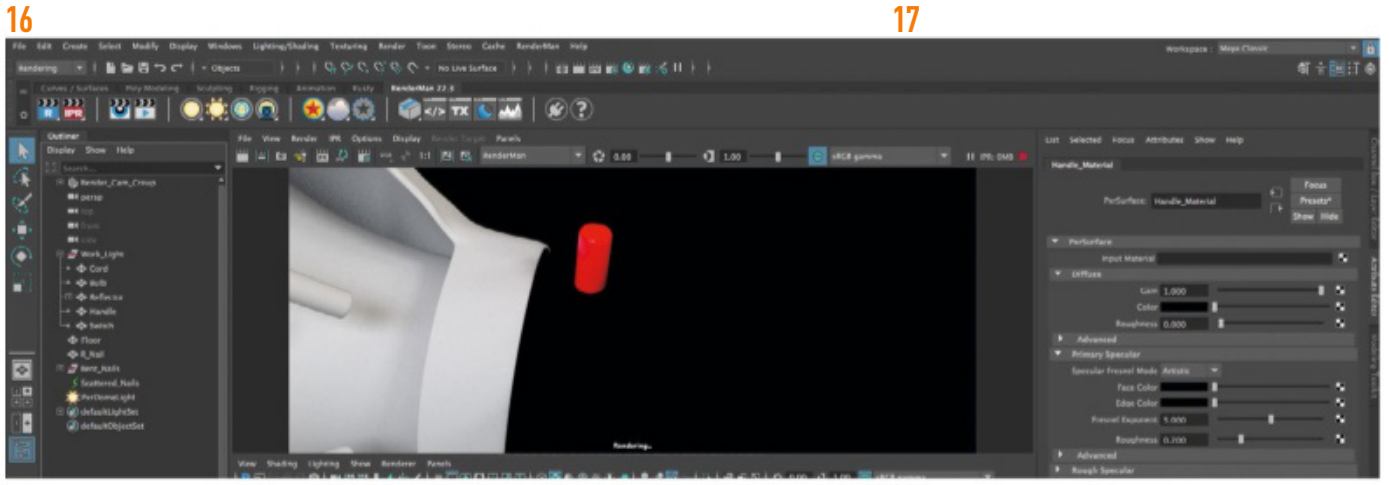
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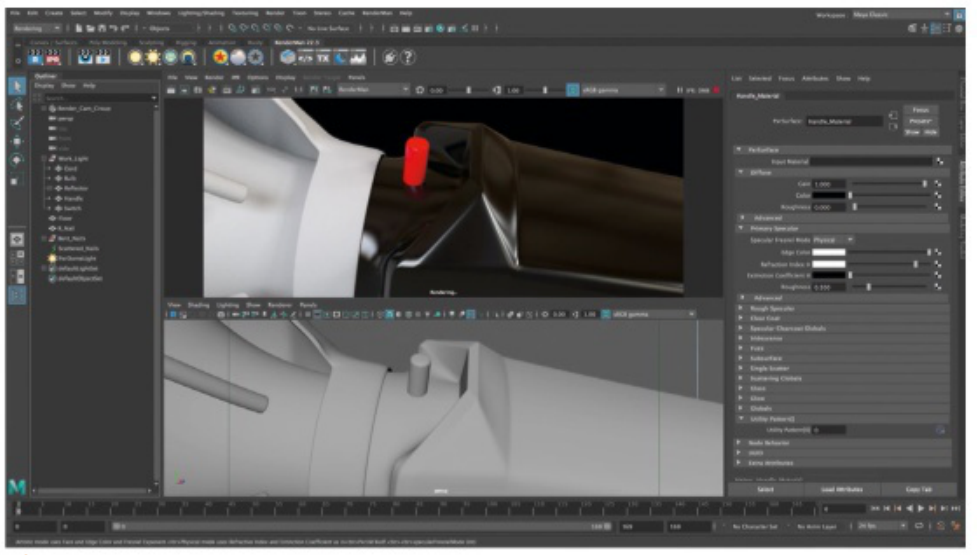

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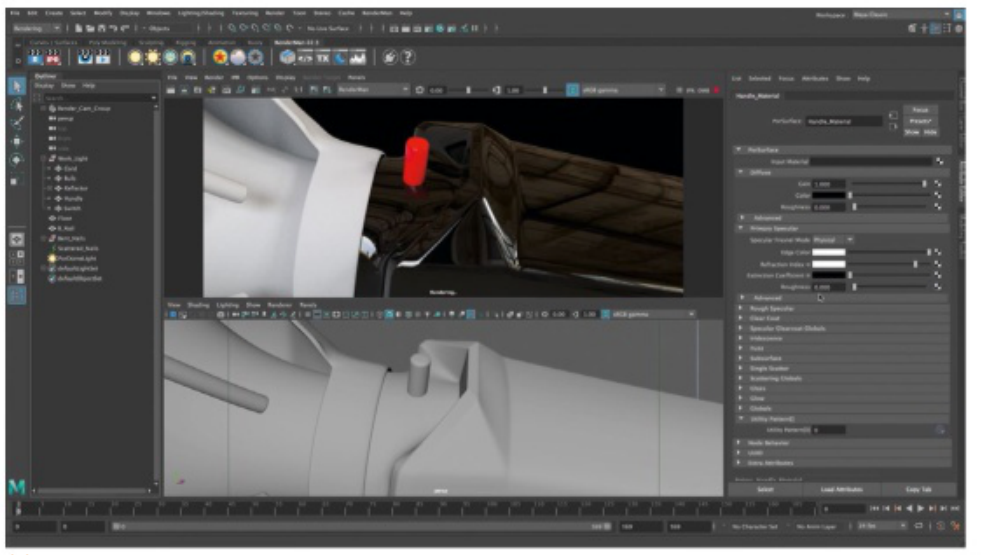

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material is quite dark and lacks any reflective properties.

19 MAKE IT REFLECTIVE

The handle material needs a bit of reflectivity in the Primary Specular lobe. Set the Specular Fresnel Mode to Physical. Then drag the Edge Color slider all the way to the right to change the colour to white. At this point, we have a shiny reflective surface, but now it's a bit too reflective for a work light that is supposed to look worn from several years of use.

20 MATERIAL ROUGHNESS

You can make a material appear shiny like a new object, or dull like a worn object by adjusting the Roughness attribute on the PxrSurface material. Let's adjust the Roughness to blur the reflections and give the surface a dull, rubber-like appearance. The roughness scale goes from 0 to 1. At 0, the surface material produces a mirror-like reflection.

21 ENVIRONMENT REFLECTIONS

Reflections we see on the surface come from the environment image assigned to the PxrDomeLight. The orientation of the handle relative to the dome light affects what appears in the reflections. If you want to adjust the reflected image you can either rotate the camera, the handle, or the dome light. Changing the rotation will adjust the orientation of the image seen in the reflections. If you want to precisely rotate the PxrDomeLight, check out the transform node in the Attribute Editor or the Channel Box.

22 ROTATE THE DOME LIGHT

Often when lighting a scene with a textured dome light it's a good idea to experiment a bit with the orientation to find the best angle that produces nice shadows and reflections. However, if you need to match the scene lighting in a VFX shot, then you won't have quite as much freedom with this since the dome light will have to be aligned to match the scene lighting in the background plate.

23 DULL RUBBER

When the handle material Roughness attribute is set to a value of 1 it looks like a matte surface without any visible reflections. We are looking for a dull, rubber-like appearance, but a value of 1 is just a bit too dull. We have lost all of the nice surface reflections provided by the textured PxrDomeLight. Let's test a few intermediate values between the extremes of 0 - 1. By using the RenderMan IPR renderer, we can experiment with material attributes and see the updates in real time.

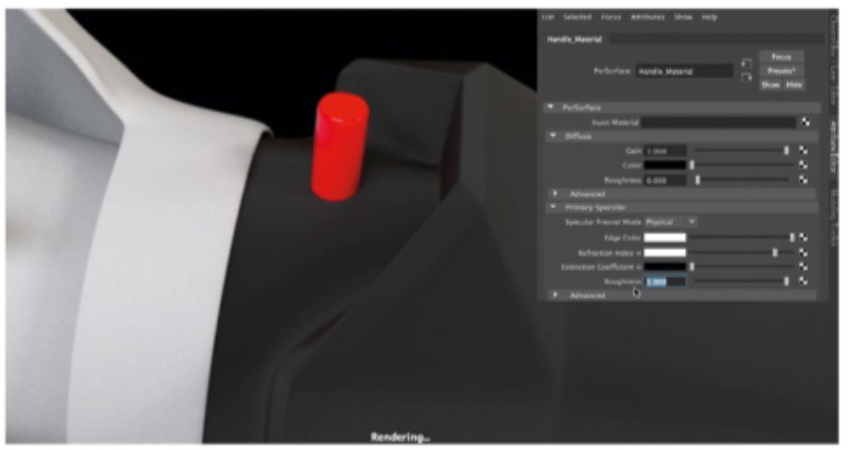
Check "it" out

RenderMan includes an advanced render view window known as "it" or Image Tool. The "it" window can be enabled in the RenderMan preferences in Maya. Objects and materials selected in the "it" frame buffer will automatically be shown in the Maya Attribute Editor.

24 FIND THE RIGHT BALANCE

A value of 0.45 seems to nicely match the look of a worn rubber material. The Roughness control makes it very easy to change an object from a shiny new material and turn it into dull, worn material. This effect can be made even more realistic by applying a texture map to the Roughness attribute. The PxrSurface material is extremely versatile and can be used to represent just about any kind of material you can think of.

Now let's save our Maya scene, and we will continue this project in part 2 of the tutorial series. •



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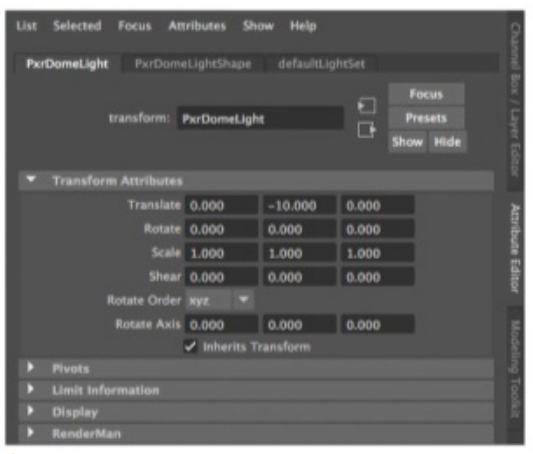

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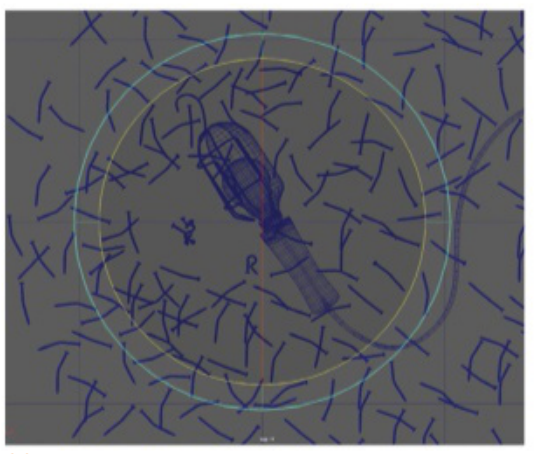

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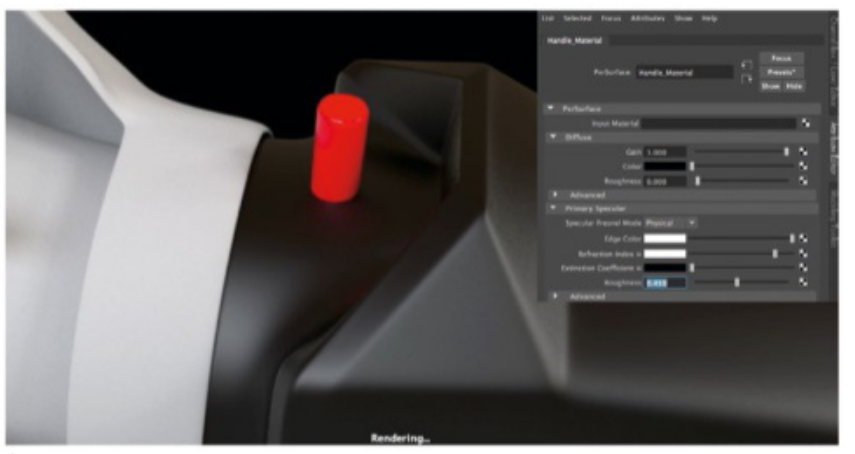

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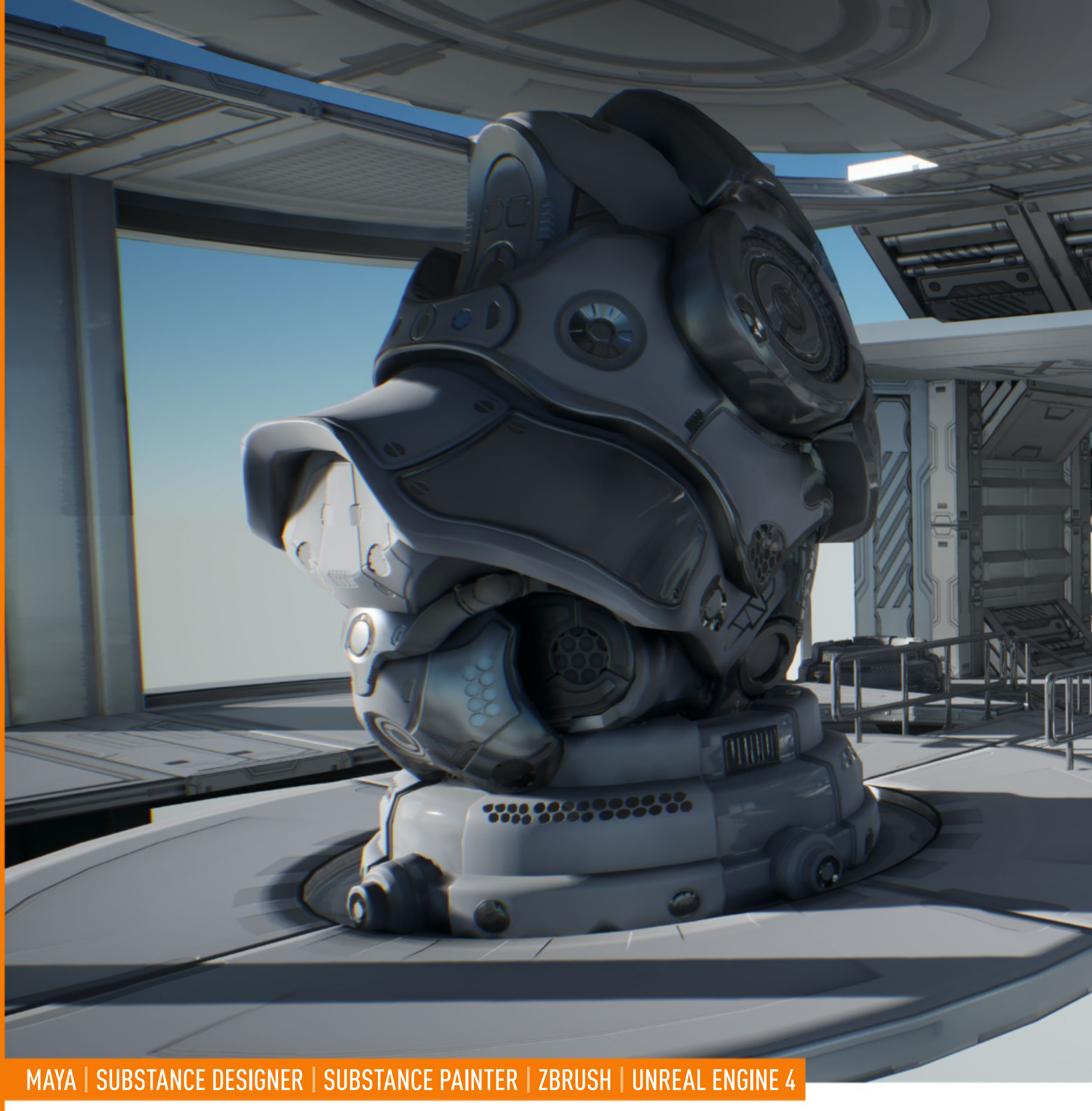
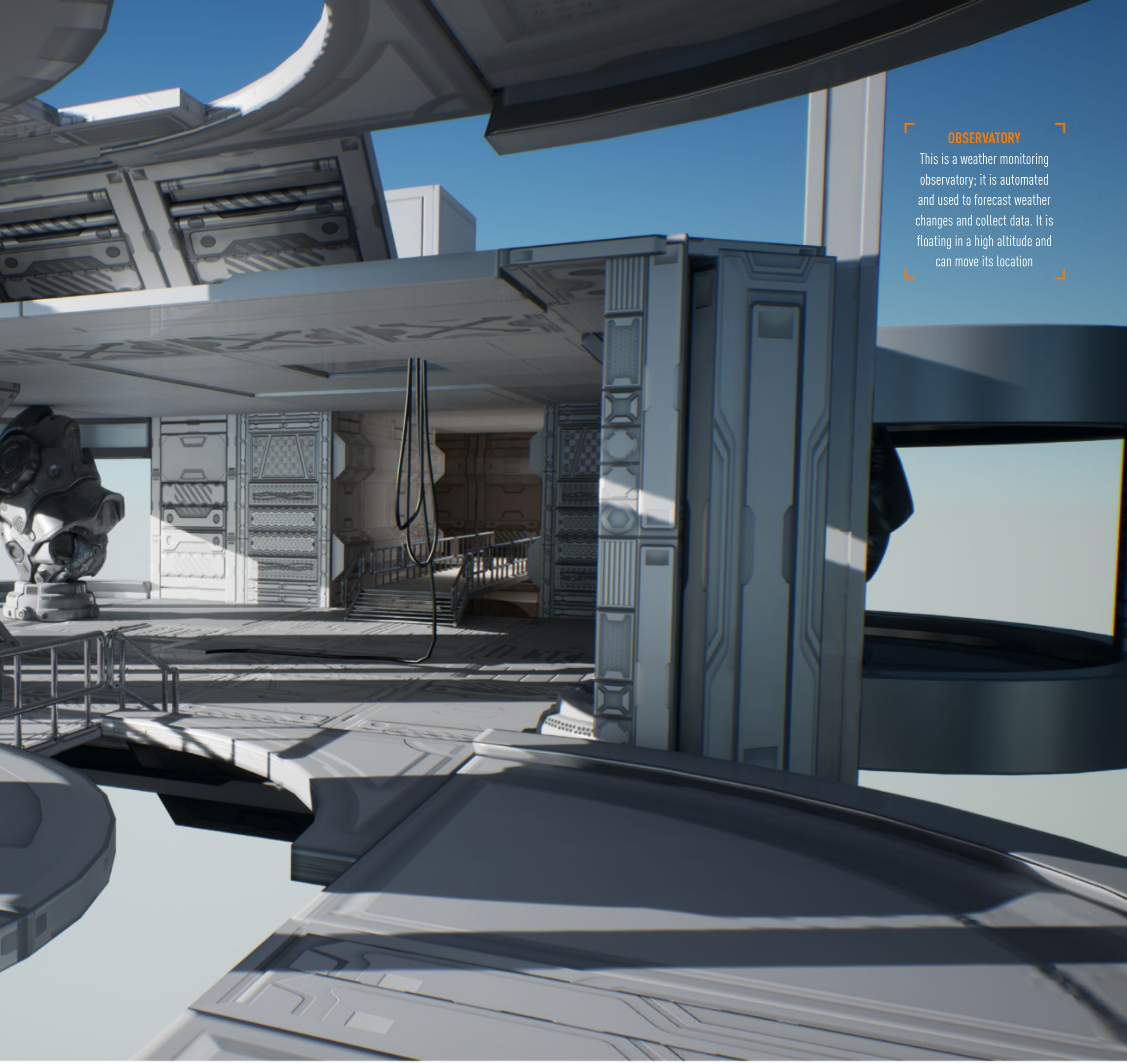


MAYA | SUBSTANCE DESIGNER | SUBSTANCE PAINTER | ZBRUSH | UNREAL ENGINE 4

MASTER MODULARITY AND TRIM SHEET TECHNIQUES

Create clean and detailed trim sheets to aid in the design of a floating observatory for weather forecasting



In this tutorial, we will demonstrate a modular workflow that utilises Substance Designer as the tool to create trim sheets. The primary goal is to show how to use Substance Designer to create clean and detailed trim sheets that can help speed up the process, as well as how to properly set up modular pieces, stack UVs, and more. The artwork was created with a minimal number of models, polycount and textures. The software used in this tutorial are Maya, ZBrush, Substance Designer, Substance Painter and Unreal Engine 4; we will cover important and unique parts to the workflow and will assume that readers have a basic knowledge of the software being used. Additionally, important designing techniques will also be discussed.

Keep in mind that there are many ways to achieve the same result; an artist could choose to use ZBrush and Live Boolean to make the panels and cables, and utilising the advantages of different applications could yield better quality. It is also worth noting that the techniques here will cover the key workflow to achieve the final result, but not every detail: there are plenty of free tutorials on the internet for specific techniques like creating cables, making slopes, and designing unique patterns.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/3DW-255

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01 MODEL MODULAR PIECES

We start by modelling the pieces. The dimension rules we use for the modular pieces are binary numbers, which means the width and height of the pieces are limited to a 'power of 2' number, like 2, 4, 8…1,024, 2,048. The reason for this is primarily because it is easier to match and combine big and small sizes, and the sizes correlate to texture resolutions. It is also important to think of the structures needed – squares, circles, stairs and tubes in various sizes are often required. The image shows all the pieces created for the artwork; the size of the green wireframed square shape in the middle is 256cm x 256cm x 16cm.

02 LAY OUT TRIM SHEET

Based on the sizes of the modular pieces, it is now time to create a trim sheet layout. Because we are using a 'by 2' system, we can also divide the trim sheet to different power of 2 sizes. Create a plane and divide it as if it is your trim sheet, and make sure that you have enough variations in proportion and size as you need. Extract the faces out and explode them like shown in the image.

03 CREATE BEVELS AND BAKE

Duplicate the mesh, move the duplication down a little, extrude out thickness, grab the edges and bevel them. Export the old mesh as low.fbx, and export the duplicated one as high.fbx. Bring them to Substance Designer and bake the bevels from the high.fbx onto the low.fbx as a normal map. This normal map should represent the bevel we want on the edge of our models, and the layout of the trim sheet. Connect the normal map to the normal map output of the graph in Substance Designer to see the result.

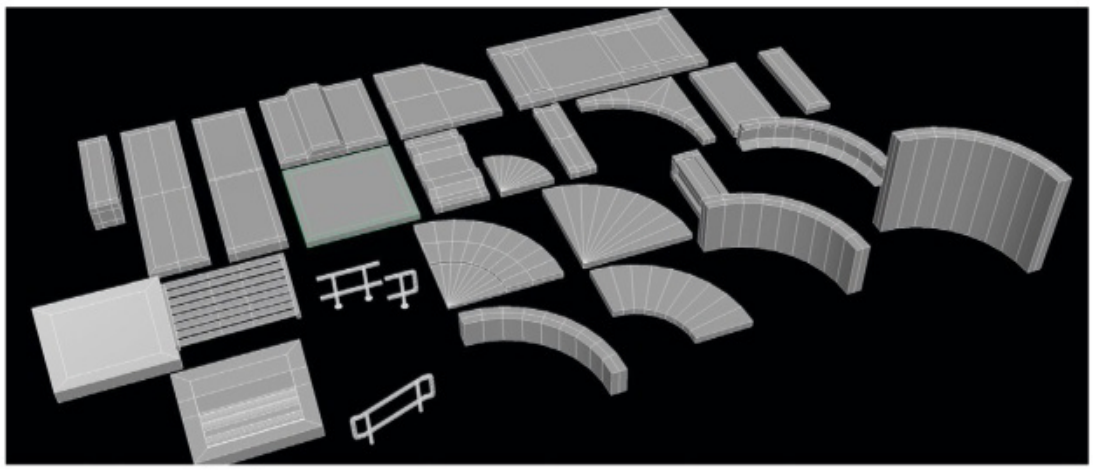
04 START THE FIRST PANEL DETAIL

In Substance Designer, go to File>New Substance, choose the Physically Based (Metallic/Roughness) Template, change the Width and Height to 2,048 px and hit OK to create a new graph.

Create a Splatter Circular node in the new graph. In the Properties

Why bake?

It may seem redundant to model and bake the bevel because you could create bevel shapes in Substance Designer right away, but experiments have shown that difficulties do arise with that approach. It also feels more intuitive to use the model to design the layout of the trim sheet and bevel. However, you are still encouraged to try and use Substance Designer to do this part and devise your own workflow that suits your style. The key idea here is to create a trim sheet layout with a normal map representing bevels.



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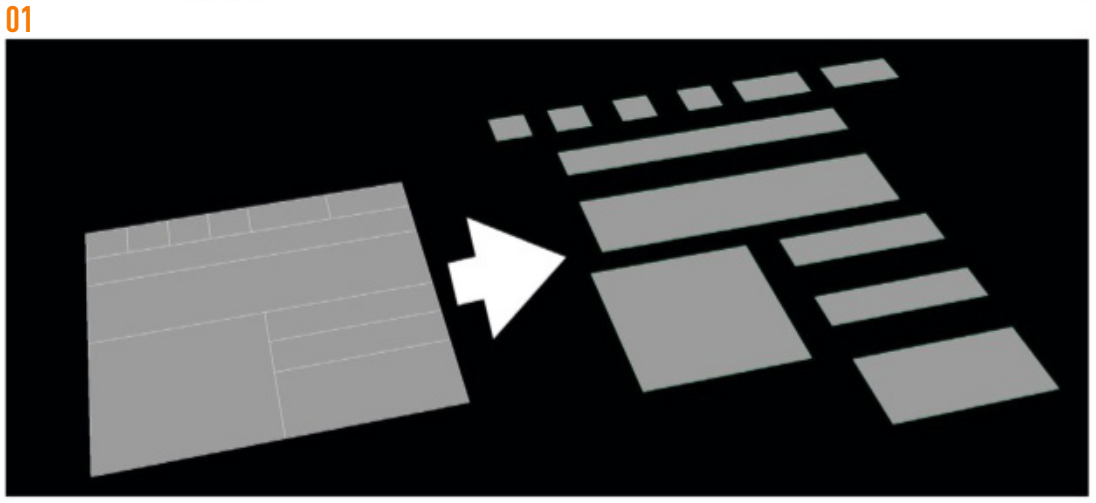

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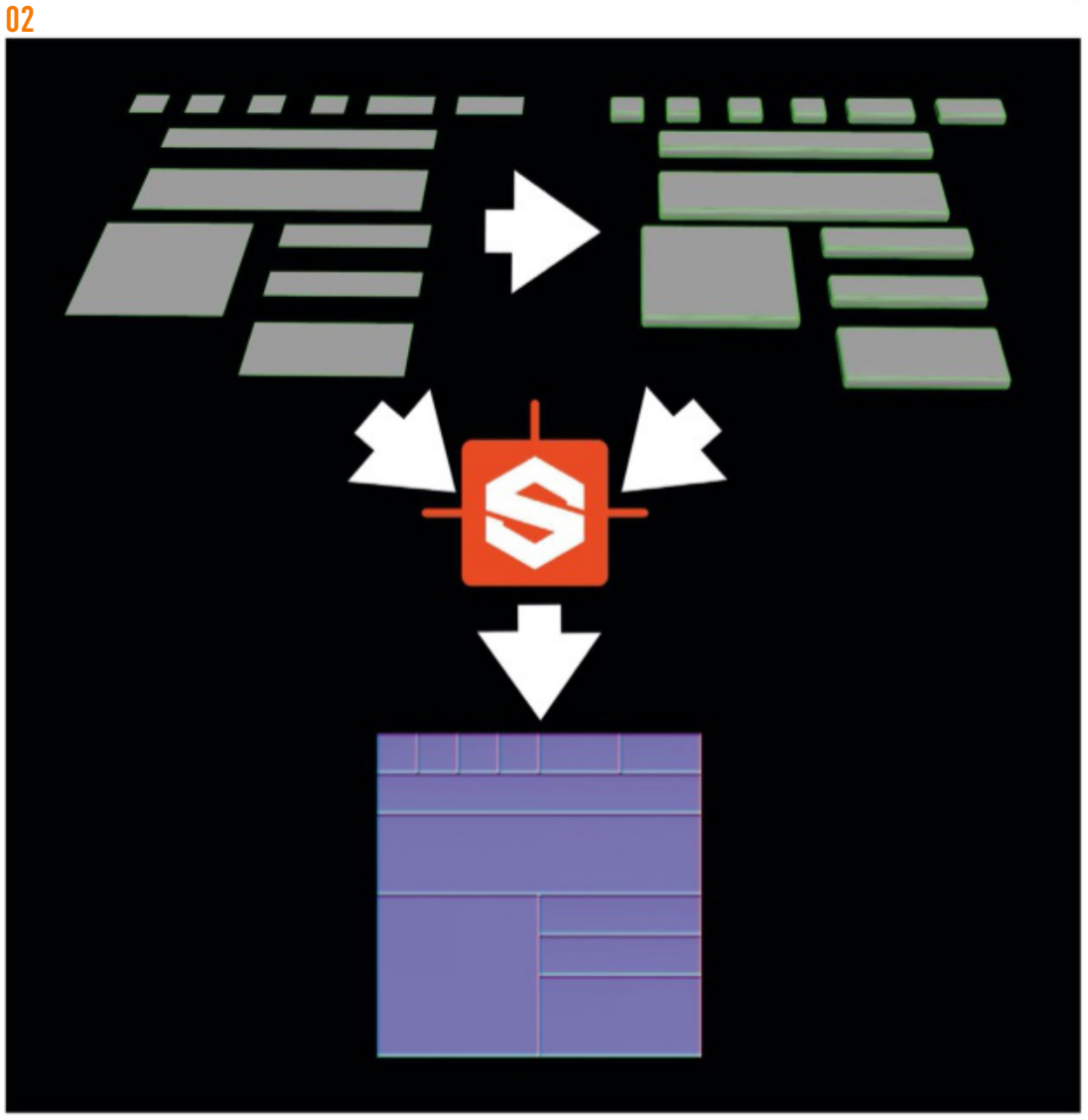

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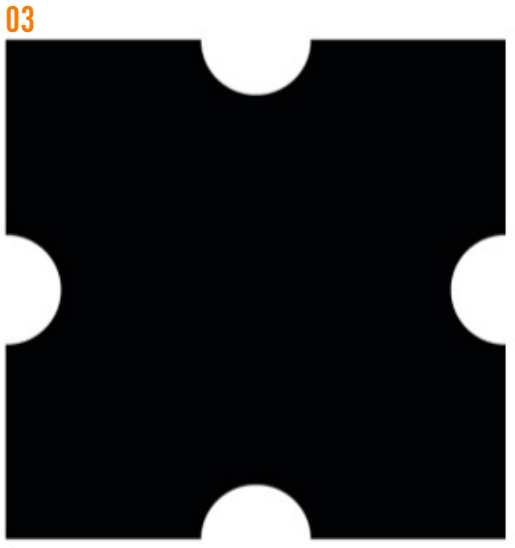

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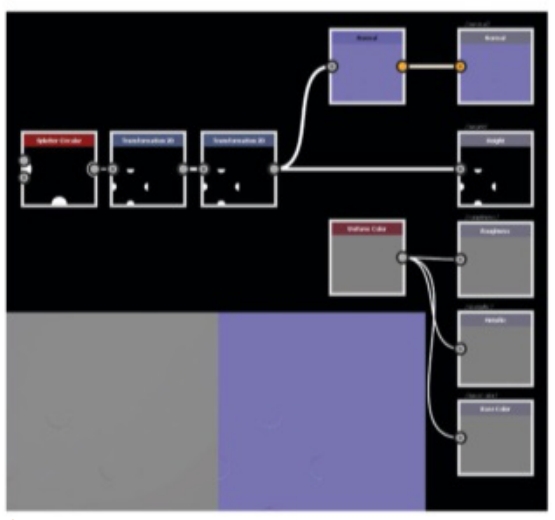

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panel, change its Pattern Amount to 4, set the Pattern to Disk, Radius to 0.5, Scale to 2.2, Ring Rotation to 45 Degrees or 0.12 Turns. This will create something like the image, which represents the four cutouts on the edge of the first panel. The setting for the Scale is arbitrary, as it's up to you to design the size of this element.

05 SET UP OUTPUTS

Connect the Splatter Circular to a Transformation 2D node. In the Parameters panel, click on the /2 to make it half the original size, set Offset X to 0.5 and Offset Y to -0.5. This will move the shape to the lower-left quarter. Pass it to another Transformation 2D node – this one serves as a 'reroute' node and nothing needs to be changed. Connect to both the Height output and a new Normal node. Change the Normal node Intensity to 30, and connect to the Normal output node. Create a Uniform Color, set it to Grayscale, set the 'L' slider to 0.5, and connect it to the Roughness, Base Color, and Metallic output.

06 AO OUTPUTS

Next connect the Transformation 2D that goes to the Height output to a new Ambient Occlusion node. Duplicate the Height output node, then change its Identifier and Label to AO, and Usage to Ambient. This will make it our new AO output.

Connect the Ambient Occlusion node created earlier to the AO output, use the right mouse button to drag the AO output node to the 3D View window, then select Ambient Occlusion to use it as AO in the 3D render. After the AO output is done, we should be able to see much clearer detail.

07 COMBINE SHAPES

Create a Shape node and a Blend node, and connect the result of the Splatter Circular to the Foreground input of the Blend node, and the Shape node to the Background input of the Blend node.

Change the Blend Mode of the Blend node to Subtract, then connect the output of the Blend node to the Transformation 2D node that was getting input from the Splatter Circular node. We should see a square shape with a circular cutout on the edges appear on the model in the 3D View.

Experiment with the design

Keep in mind that Substance Designer is all procedural, and the combinations and settings are up to you to adjust to get the result you need. It takes experiments and even happy accidents to get something interesting, so don't hesitate to break it and mix it up.

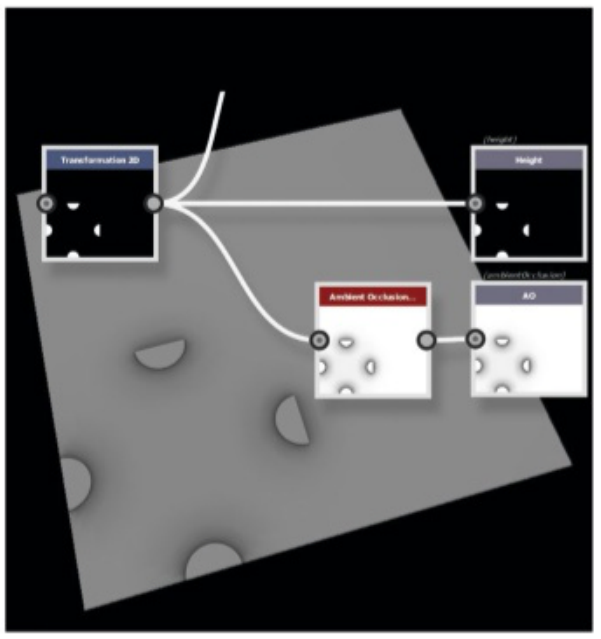
08 BEVEL THE EDGES

Connect the Blend node we did in the previous step to another Transformation 2D node. In the Tiling Mode, click the drop-down menu for the method of inheritance and change it to Absolute. Change the drop-down menu below from H and V Tiling to No Tiling.

Hold down Ctrl and Shift and drag any corner of the widget in the 2D View to shrink the shape just a little bit. Connect the result to a new Bevel node, and change the Distance setting to 0.05. Connect the result to the Transformation 2D that transforms our shape to the lower-left quarter. This should give you a nice bevel around the shape.

09 ANOTHER INTERNAL PANEL

We now need to connect the Transformation 2D that's right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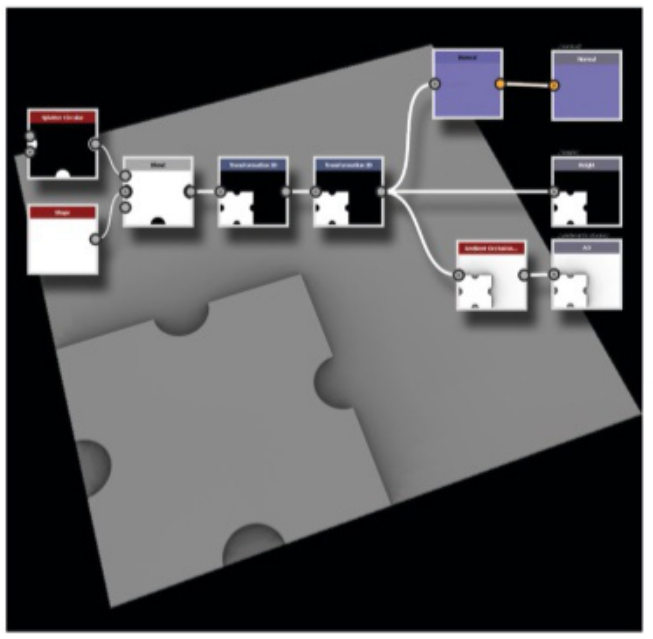
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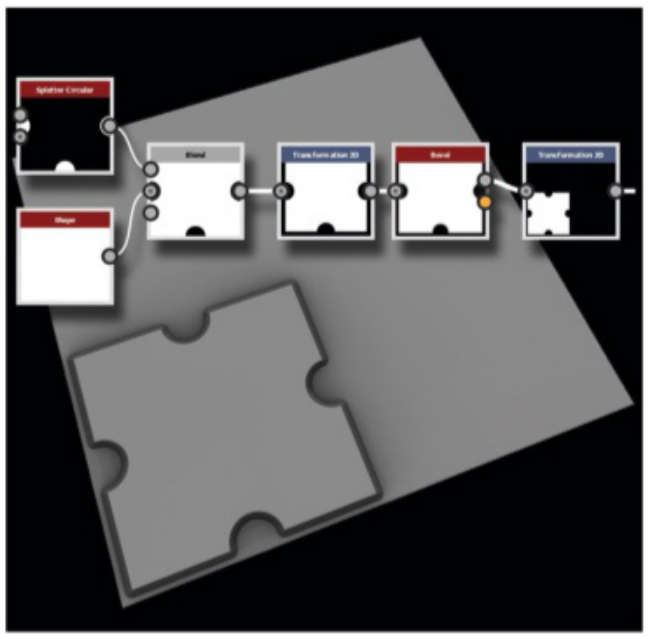
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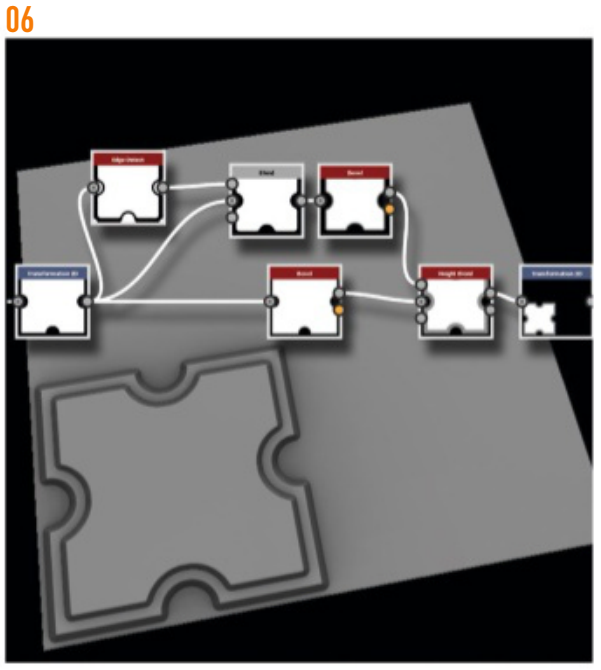
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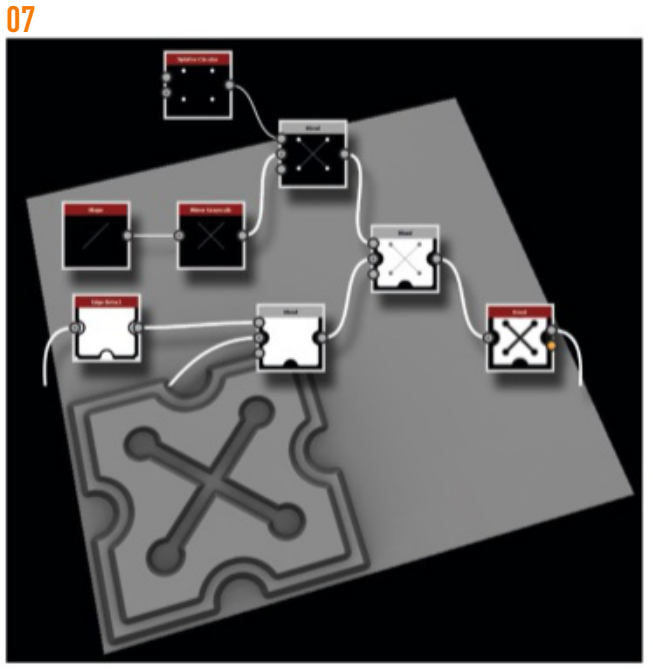
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after the Blend node to an Edge Detect node. Set the Edge Width to 4.5, and Edge Roundness to 12.

Create another Blend node. Connect the Edge Detect to the Foreground input of the Blend node and the Transformation 2D node before it to the Background input of the Blend node. Change the Blend Mode to Multiply.

Connect another new Bevel node after the new Blend node, and set the Distance to -0.08. Now to blend the new panel on top of the previous panel, create a Height Blend node, connect the new Bevel to the Height Top input and the old bevel to the Height Bottom input; change the Height Offset to 0.75.

10 INTERNAL DETAIL

Create a Splatter Circular, set the Pattern Amount to 4, set the Pattern to Disc, Radius to 0.32, and Scale to 0.66. Create a Shape node, set the Pattern to Square, Scale to 0.58, Size X to 0.01, and the Angle to 45 Degrees.

Pass it through a Mirror Grayscale node, and set the Mode to Mirror Corner. Set the Corner Type to Top Right. Connect the Splatter Circular and the Mirror Grayscale to the Foreground and Background input of a Blend node, and set the Blend Mode to Add (Linear Dodge).

Create another Blend node, connect the Blend node before the bevel of the upper panel to the Background input of the new Blend node, and the Blend node that blends Splatter Circular and Mirror Grayscale to the Foreground input of the new Blend node. Set its Blend Mode to Subtract. Connect this new Blend node to the Bevel node of the upper panel.

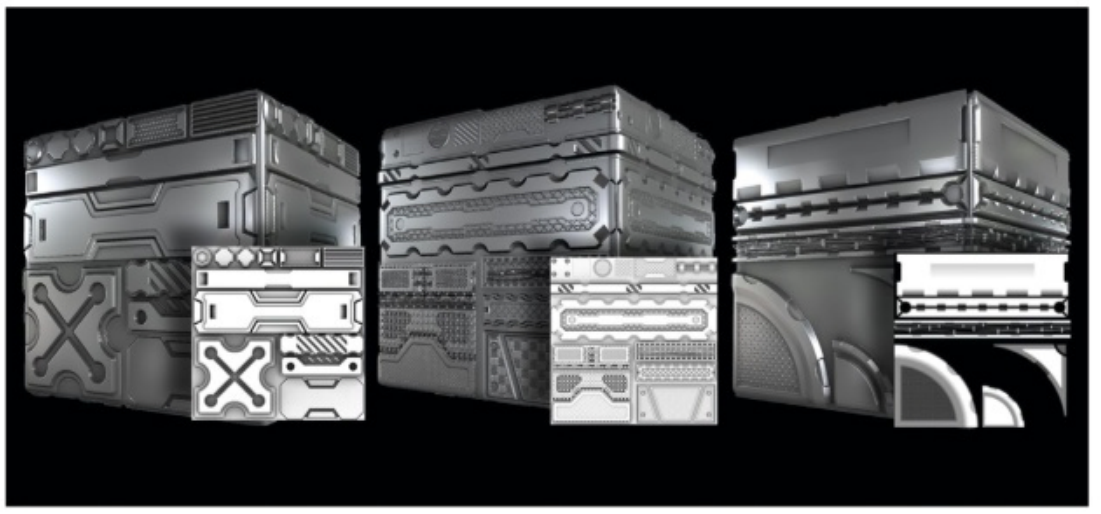
11 BLEND WITH THE BAKED NORMAL

Go to the Resources folder in the Explorer panel, and drag the previously baked normal map to the graph. Connect the Normal node and the Bitmap of the baked normal to a Normal Combine node, then connect the Normal Combine node to the Normal Output node.

Go to the 3D View, click on the Scene menu and select Rounded Cube. Make two duplications of the Uniform Color that was connected

The hero asset

The hero asset is the focus of the scene, it needs to be unique, detailed, and mostly polished. ZBrush hard-surface techniques, Maya and Substance Painter were used to build the hero asset. The detailed process of building and lighting it is out of the scope of this tutorial because our focus is on the essence of the trim sheet workflow. It is also very possible to incorporate Houdini into the workflow to automate the assembling process.



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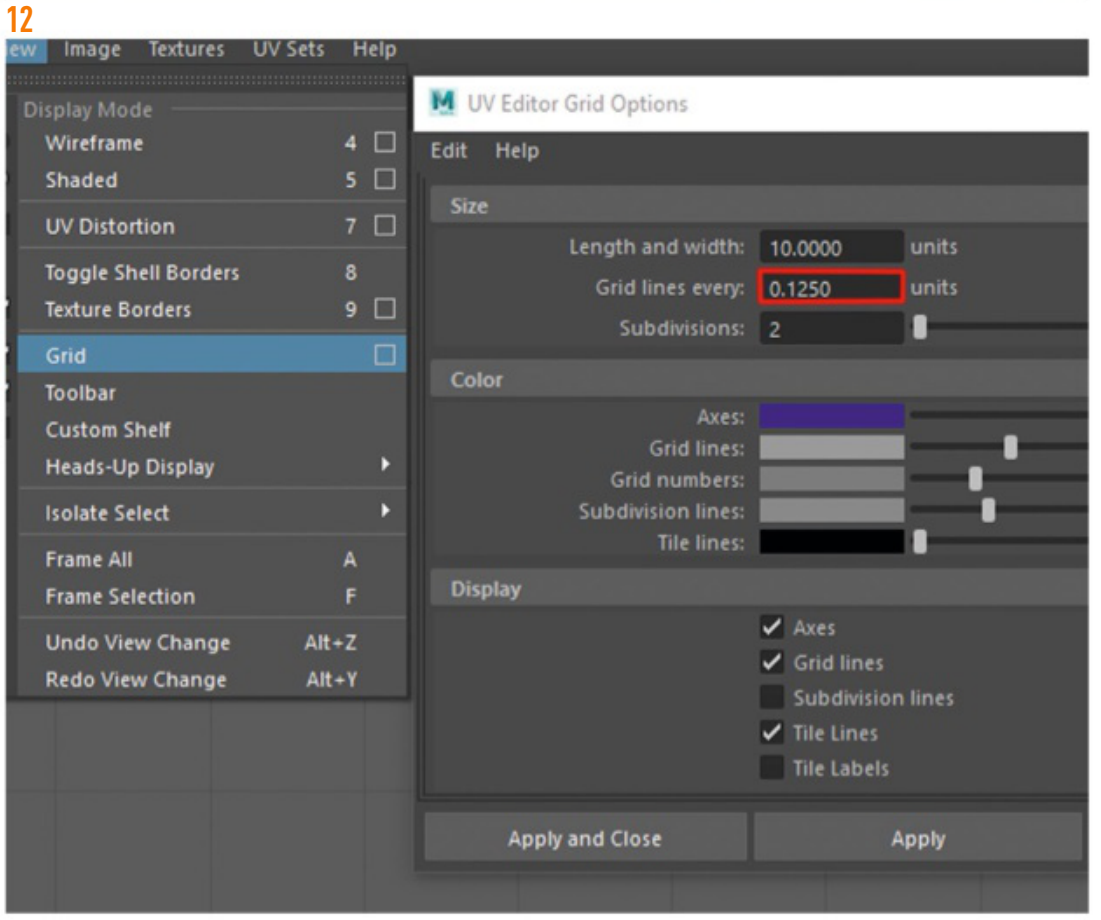

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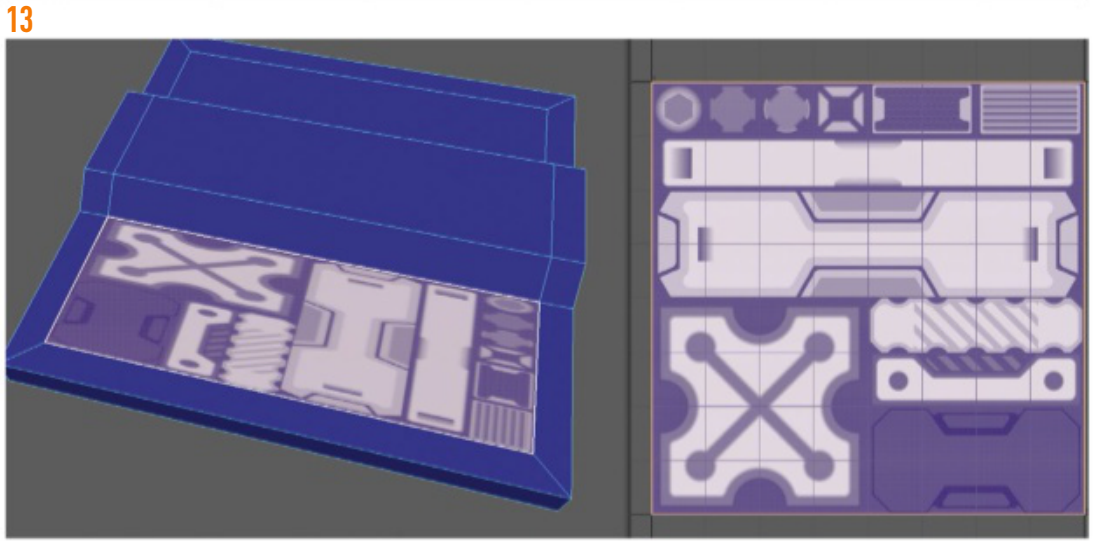

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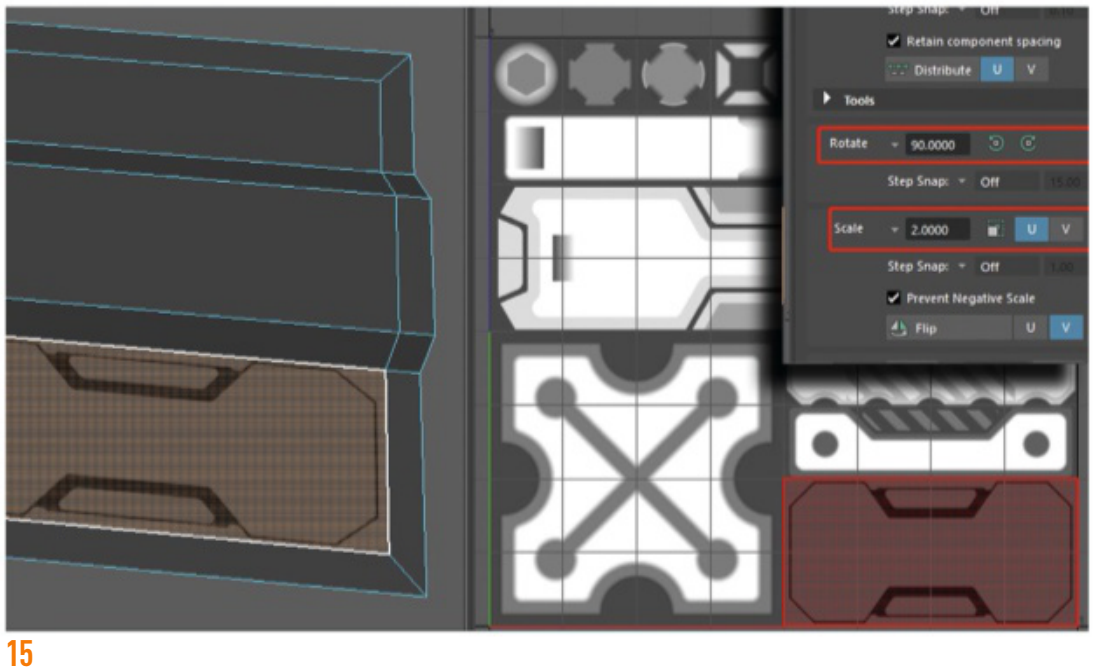

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to the Base Color output. Connect one of them to the Roughness output and another to the Metallic output. Tweak their values to make the material look more like metal.

12 MORE PANELS

Keep creating new shapes and combine them into panels of different sizes. Use the Blend Transformation 2D nodes to combine them into a full trim sheet. You can create multiple trim sheets with the same layout but different details, the possibility is limitless. This artwork uses three trim sheets with two different layouts in total – the second layout has circular shapes because the modular models have circular shapes as well.

13 PREPARE MODULAR PIECES FOR UV

Select the AO output node, and click on the floppy disk save button in the 2D View to save the image. Name it Trim_Sheet_Ref. Go to Maya, select one of the modular models, and assign Trim_Sheet_Ref as the colour of its material. We can now see how the detail will appear on the model.

Open the UV Editor, go to View>Grid, and click on the box-shaped icon to open the grid settings. Change 'Grid lines every' to 0.125 and click Apply and Close. This divides the UV space into seven grid lines and eight parts, which allows accurate snapping.

14 SELECT FACES AND LAY OUT UVS

Go to UV>Delete UVs. Select any faces you think will fit with a panel on the trim sheet. Do a Planar projection or Cylindrical projection to get the UV laid out – you may need to make some adjustments to fix distortion. Select the UVs you are working on, and go to Modify>Layout. Go to the settings, change Scale Mode to Non-Uniform, and click Layout UVs. This fits the UV to the Entire UV Space.

15 MATCH UVS TO TRIM SHEET

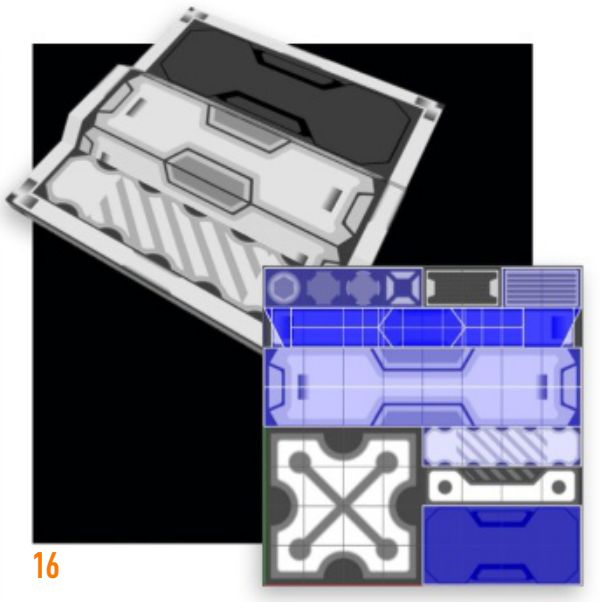
Grab the UVs, and go to the UV Toolkit. In the Transform section, use Rotate and Scale to transform the UV to the size of the panel you want the UVs to match with. You can scale the UV on the U and V direction together or only on one of them. When you have the right size, select the UVs, hold down the X button on the keyboard, and move the UVs to the panel you wish it to match. The UVs should snap and cover the area perfectly.

16 FINISH UV AND EXPORT

Repeat the previous steps to create UVs for all other faces and modular pieces. There might be places you need to tweak the model to avoid stretching, but overall, it should be a smooth process. When you are done with all the UVs, make sure the models have their pivot located on one of their corners that you wish to match with each other, and that corner also sits at the origin of the world. Export the models and import them into Unreal Engine 4.

The reason behind binary numbers

We use binary numbers for the size of our modular pieces, so that many faces on our model could have similar or exact width and height ratio with the panels on the trim sheet. We also set up the grid of the UV to have a binary division so we could easily snap to the grid to match to the centre of any panel. All this setup and planning is needed to get a perfect UV layout to match with the trim sheet.



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17 MOVE TO UE4 AND ASSEMBLE

Export the maps you wish to use from Substance Designer and move to UE4 to build your materials. Drag different materials to different modular pieces and assemble the pieces into a scene.

A hero asset was also created, and the image below shows the result after lighting and baking. Everything in the final artwork is modular except one hero asset, one cable model and some decals. •

17

TEA HOUSE
This lovely tea house was created by Jourdan Tuffan. He is an amazing artist and did a great job with the design, translating the atmosphere was a fun challenge!

MAYA | ZBRUSH

BUILD A STYLISED TEA HOUSE

Take a stylised concept and translate it to 3D using Maya, then export it to ZBrush to add detail

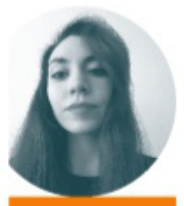
In this tutorial we will be going through the process for translating a stylised concept to 3D using Maya, and then exporting to ZBrush to add further details. Since I wanted to improve my skills in stylised work, I picked this tea house to provide me with a challenge (original concept by Jourdan Tuffan).

At first, when we are just starting, translating a concept to 3D can be a little overwhelming. After choosing the concept to work with, we need to select the best tools for the job that will be able to simplify our work process and enable us to work as efficiently as possible.

It's important to know that all we are going to learn can be used in any 3D modelling software, since the knowledge and design rules are the same. We could simply start in ZBrush, but it's better and faster if we combine both modelling techniques: polygonal and digital sculpting.

A final note: there are no secrets to this methodology. Just enjoy the process and have fun experimenting with different forms, shapes, details, and being creative doing something you enjoy.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/3DW-255



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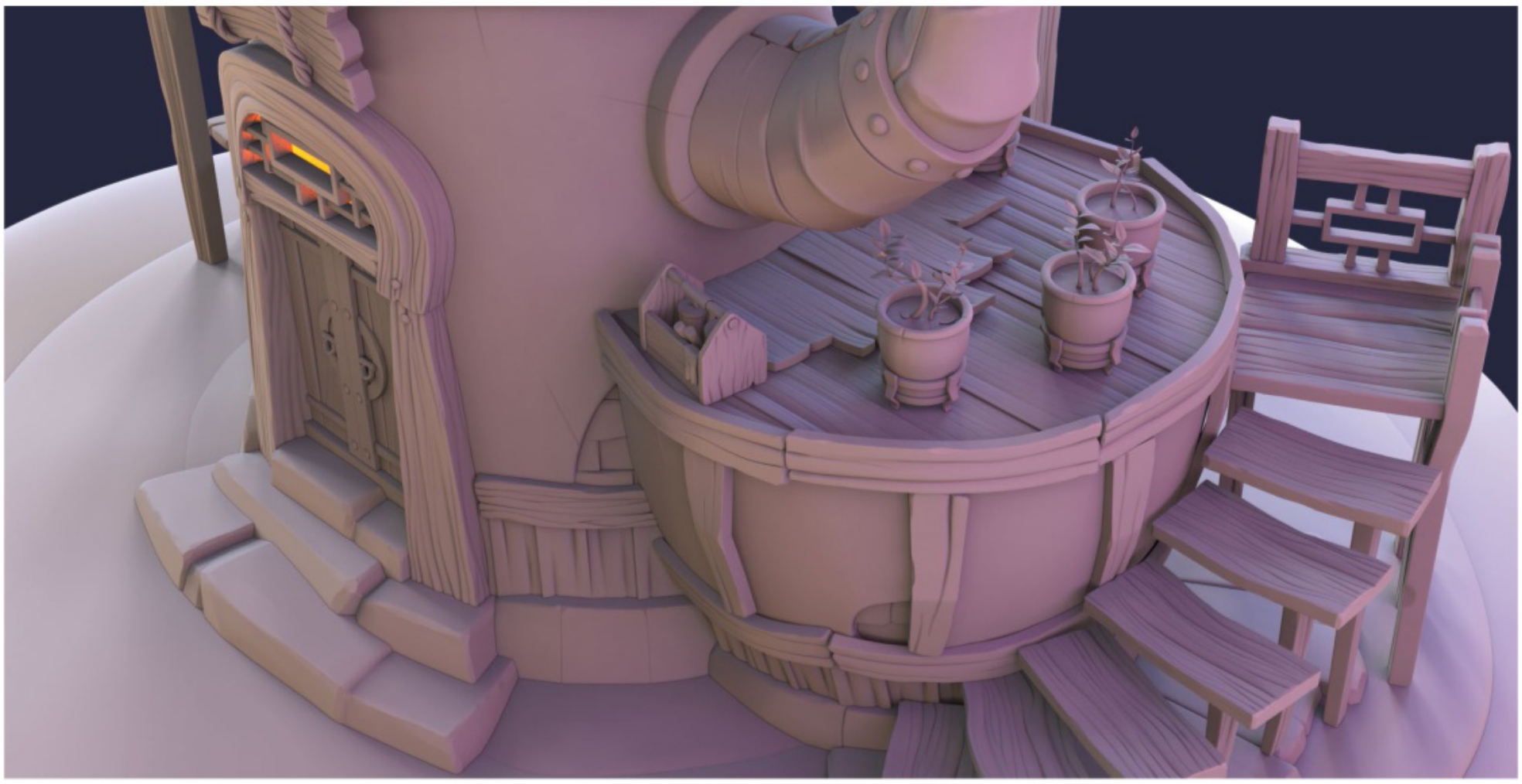
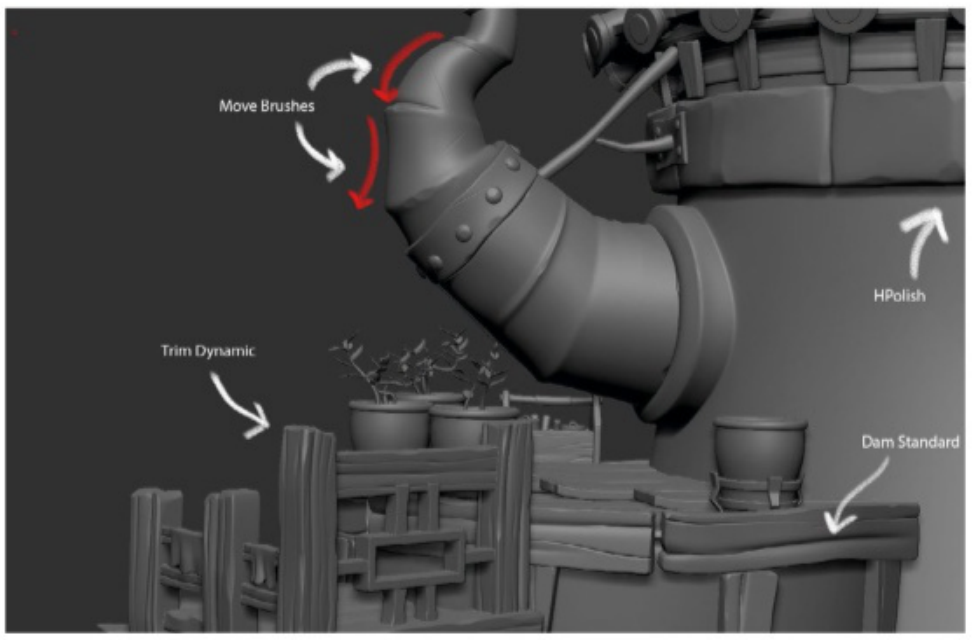
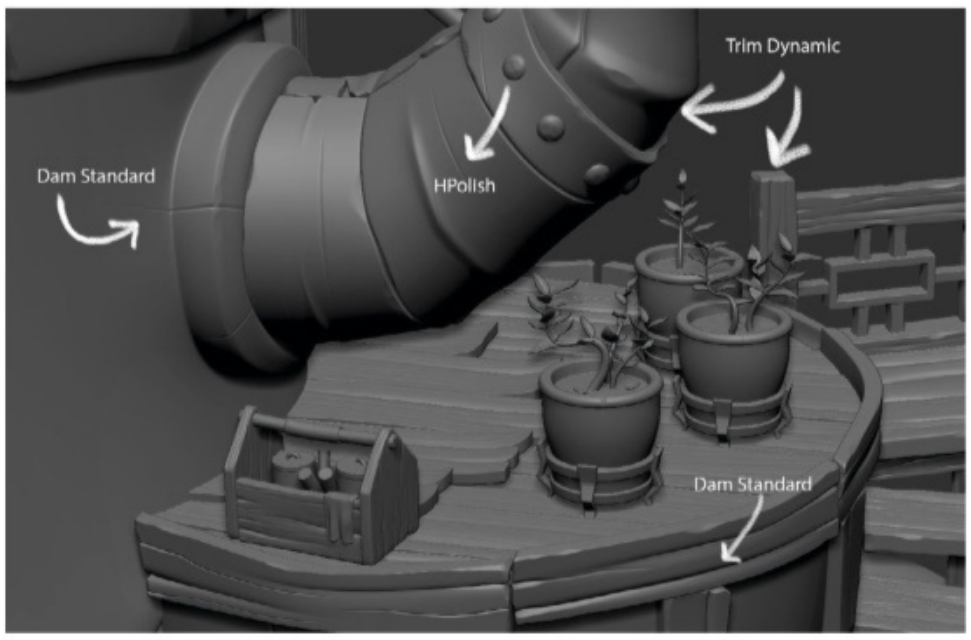



Move Brushes
HPolish
Trim Dynamic
Dam Standard


Trim Dynamic
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01 CONCEPT IDEA

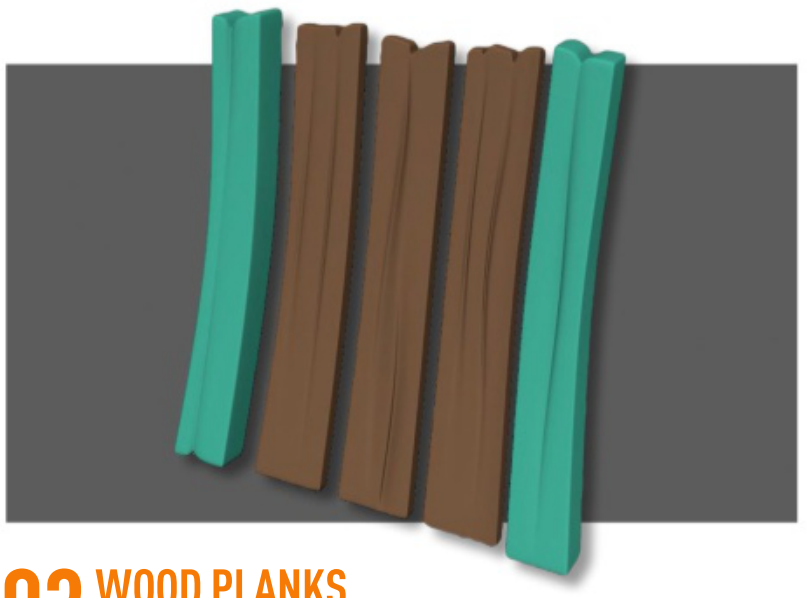
When we do stylised work, we need to have in mind some general rules: simplification, silhouette and form, details and points of interest (to name a few!). If we have a concept that is full of information and we can't model everything, identifying the elements that really represent the idea and the feel we are aiming for will help us focus on the main shapes. We can do this by sketching over the concept and identifying the main volumes and interest areas so we can have a quick visual reference for our next step.

02 BLOCK IN MAYA

Once we have our ideas set, we can establish a base mesh in Maya (or other 3D software). Maya is a good choice because it has some really helpful modelling and even sculpting tools to speed up our process. First, we need to focus on the creation of the main shapes and their place in our scene with basic primitives. A good base mesh is the key for an organised scene.

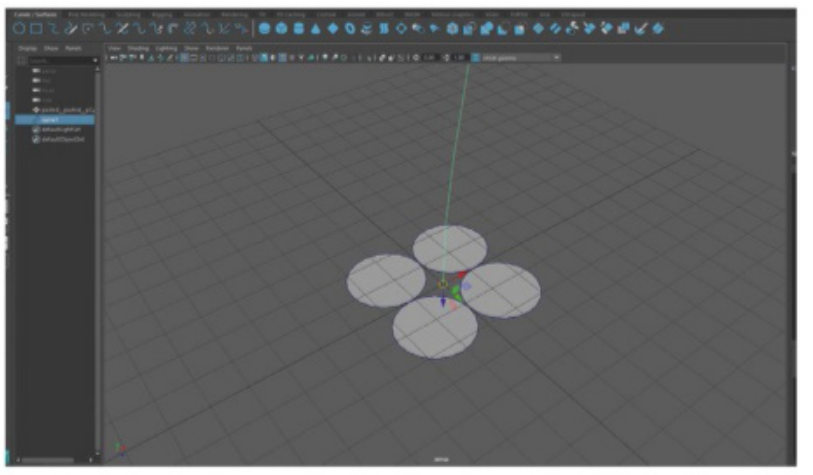
Keep references

Get inspired and save pictures of the movies you like, artists you admire and concepts that have the style you want to study. Find artwork that presents more than one view and a perspective camera angle. This will be really helpful to appreciate the volumes we will work on. Keep all the references close – PureRef is a good, free tool for this.



03 WOOD PLANKS

Let's create a box primitive and scale it until it looks like a plank. For this we can click and drag in the scene or use the Scale tool later. With Insert Edge Loop we will place the edges where necessary for cuts and move the vertices until we reach a shape we like. In this case we can do three plank variations, playing with carves and details.

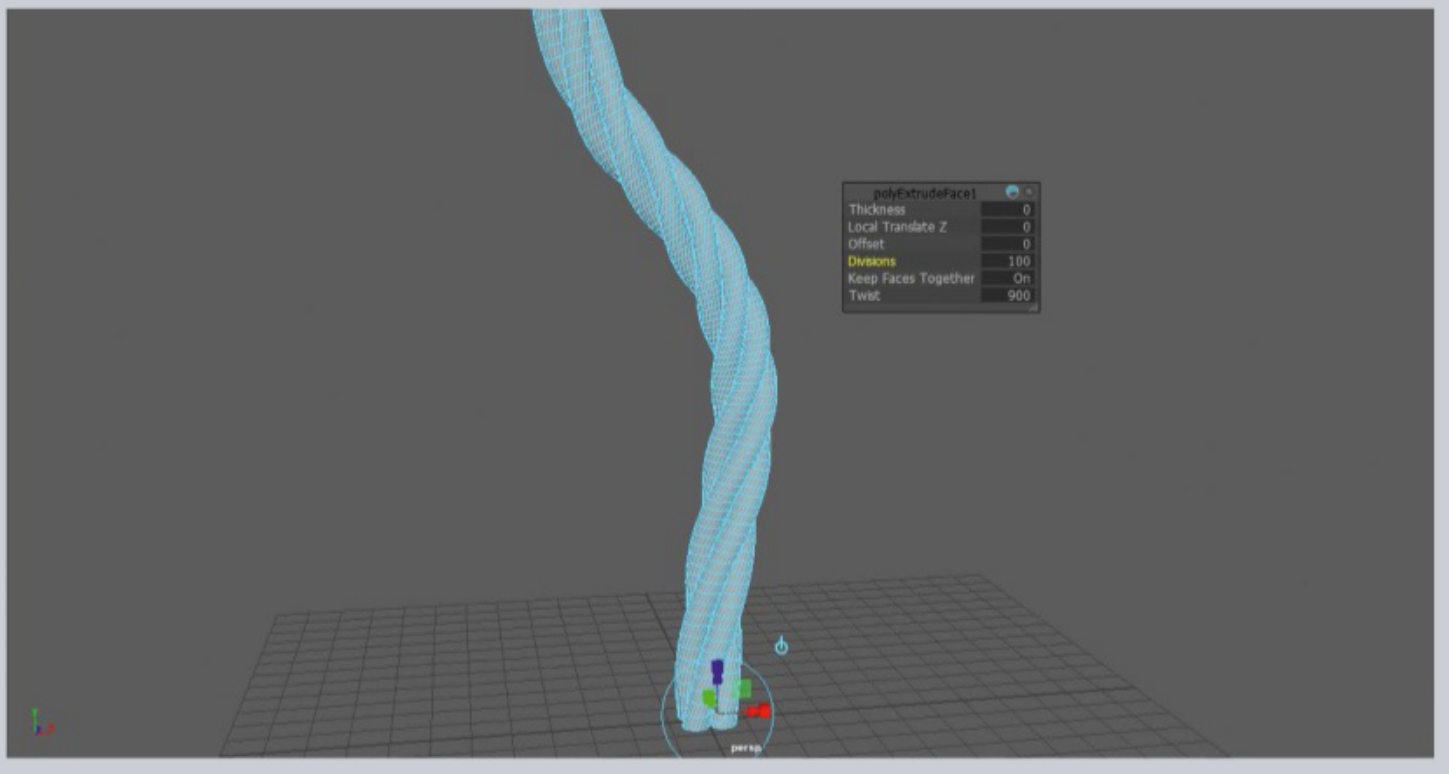


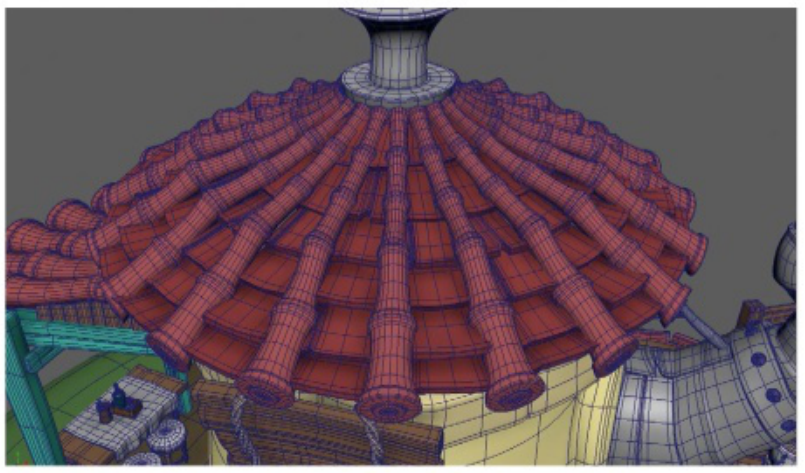
04 MODEL THE ROPES

First create a cylinder with no cap subdivisions. Delete all the polygons except the top cap, duplicate it four times and combine the final circles so we have one geometry. Make sure they are at the centre of the grid and scale it how you want the thickness of the rope to be. In the Curves/Surfaces shelf we will find the CV Curve tool. Place the curve at the centre of the four circles.

05 MODEL THE ROPES II

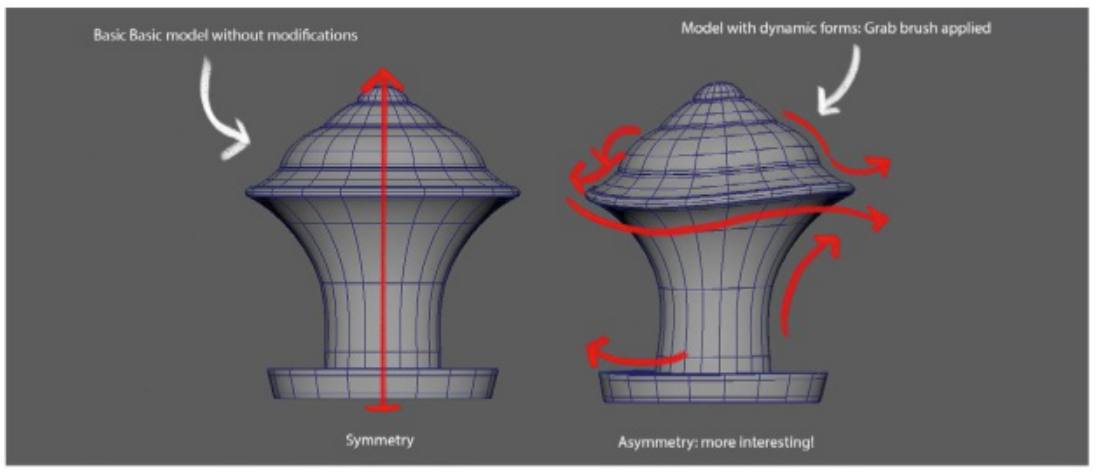
Pick the four faces of the circles and finally the curve. Go to Edit Mesh and select the Extrude modifier. It's important to know, the more divisions you add, the more the geometry will follow the shape of the spline smoothly. To add rotation to the fibres, select a high value in the Twist option. And now we have a rope! You can modify the curve and play with the thickness of the caps, to achieve the result you want.





06 SUPPORT EDGES

To finish our assets it's important we add support edges in the corners (creasing) so we don't get deformations later while smoothing. We can also add edges in the geometry to have a better resolution mesh to work with in ZBrush. If we don't, subdivisions won't work as well and we'll have to use other tricks like DynaMesh or ZRemesher.

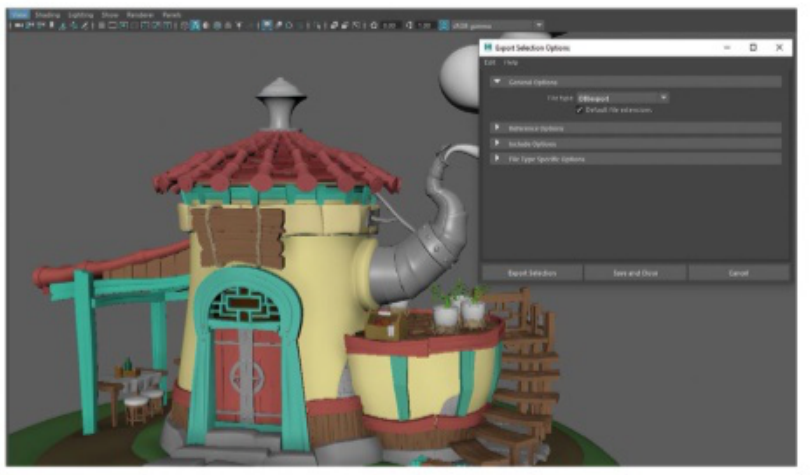


07 DYNAMIC SHAPES

To get a more cartoonish look we need to break the forms and symmetry, adding interest to our shapes. Good tools for this are the sculpt brushes, found under the Sculpting shelf in Maya. The ones we'll find most helpful are the Grab brush to move geometry and the Smooth brush to relax vertices in the mesh. To adjust the brush size press B + middle mouse button and drag left/right. To adjust the brush strength press M + middle mouse button and drag up/down.

08 GENERAL SILHOUETTE

Once everything is modelled, we can do a base mesh silhouette check by applying a Black Surface material. If our visual reading of the form is correct and matches the general idea of the concept, then we can proceed to export it. You can also apply other materials like Blinn to identify any imperfections using the glossiness in it.



09 EXPORT OUR SCENE

Select all the objects you want to work with in ZBrush and go to File>Export Selection, and save as OBJ. In the case we have some geometries that ended up with a low resolution, we can always add the Smooth modifier inside the Mesh menu. With only one division we can achieve a nice level of topology, then we can proceed to export the scene.

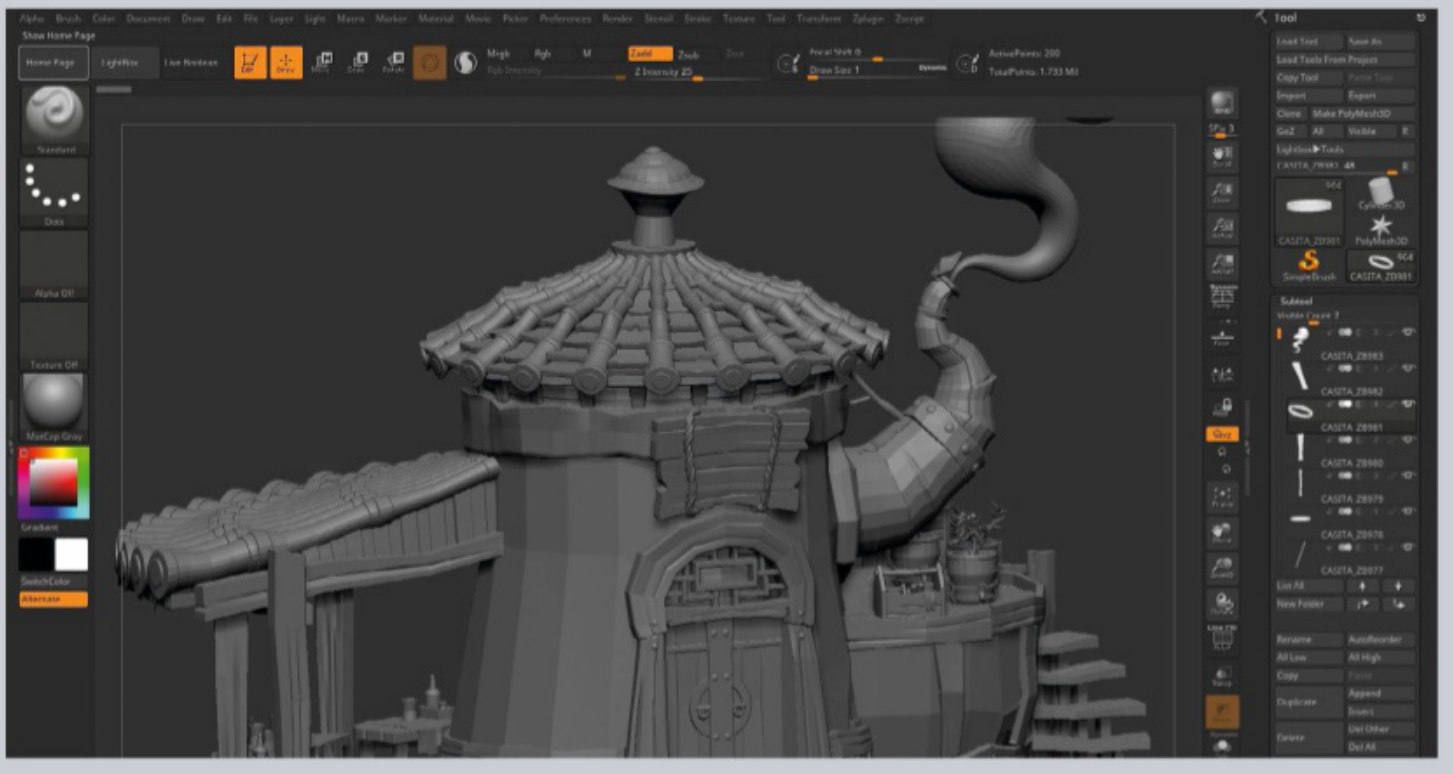
Keep your scene organised

The ideal is to have groups of objects according to their placing in our scene. For example: 'Balcony_wood_msh00' belongs to 'Balcony_woods_grp' and finally to the general 'Balcony_grp'. To name several objects at once we select them and go to 'Input Line Menu of Operations' and 'Name'. What we type will affect all our selection.

10 START IN ZBRUSH

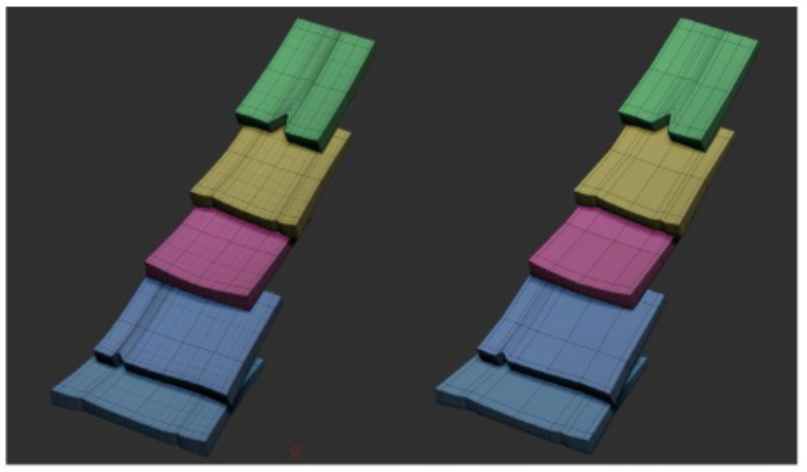
Open a new scene in ZBrush and import the OBJ we exported from Maya. Remember to press 'T' to enter Edit Mode.

In our Subtool menu, let's select Split to Parts so we can work on them individually. It's important to know that if we exported combined objects, they will appear with different Polygroups. Lastly, we can use the new folders feature that will help us keep an organised scene.



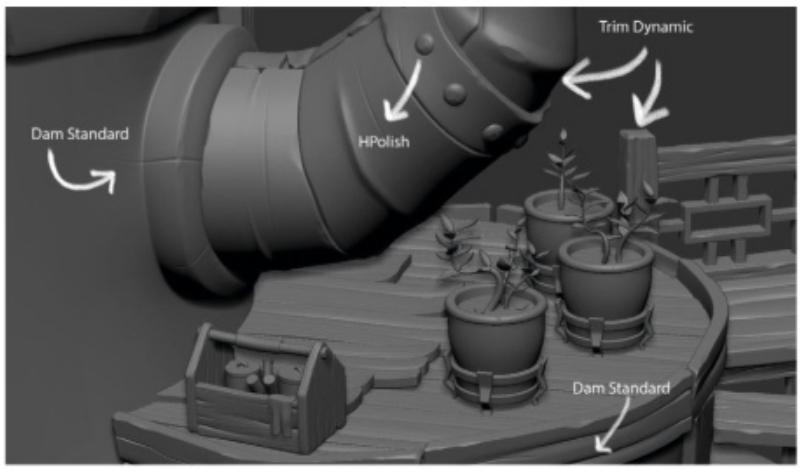
Export without KeyShot Bridge

If we don't have the KeyShot Bridge and we want to export our scene to another render engine or software, we need to go to ZPlugin>SubTool Master>Export. If we have Polypaint information we want to transfer, the mesh will need to have UVs. We can also use our exported model to work in Substance Painter or any similar software of our choice.



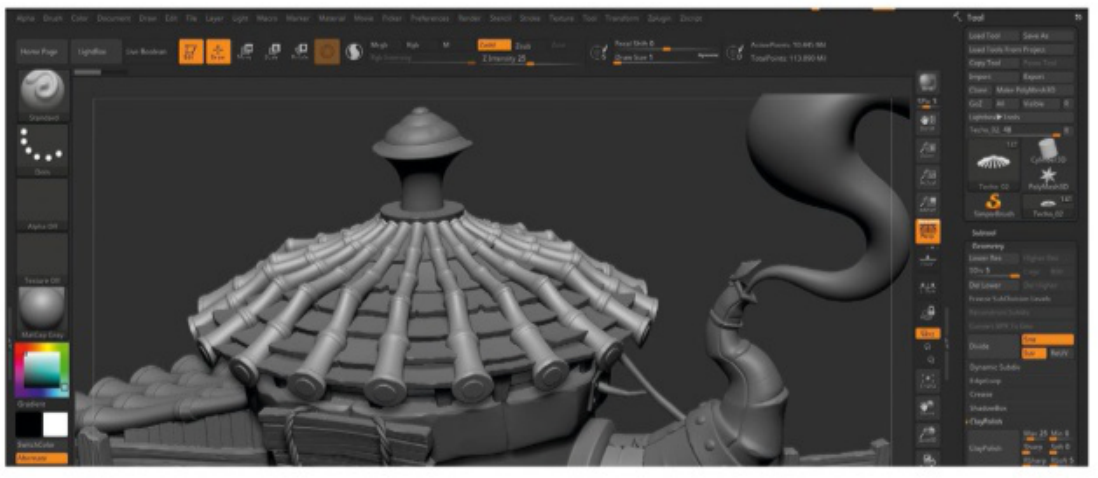
11 WORK WITH SUBDIVISION

To start adding detail we need to subdivide our geometries. In the Geometry menu we have the Divide option that increases our mesh definition. To have a preview of our subdivisions we can work with Dynamic Subdiv, but it has some limitations. A good subdivision level to work with is 3. If we need more, we can use DynaMesh and ZRemesh it later.



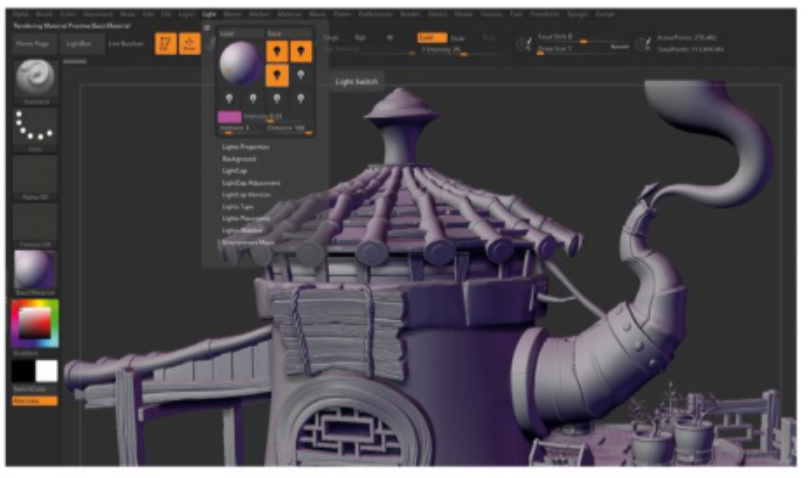
12 ZBRUSH BRUSHES

There are different types of brushes to work with; Move, Move Topology and Smooth will enable us to give shape and redefine the silhouette of our props. We can exaggerate some volumes to stylise them more, and give visual focus. Dam Standard and Clay brushes can be used to add details in woods and stones. HPolish and Trim Dynamic work well on edges, especially for stones.



13 FINISHING DETAILS

When it comes to adding the final touches to our model, we can play with some features from ZBrush to give them a more interesting look. For example, the Clay Polish tool is great to add crispy edges on rocks or similar elements (roof tiles, old metals). Also, we can experiment with Polypaint or adding alphas to our brushes. The important thing in this part is to have fun and enjoy the process! Don't be afraid to push further on the details and always save the variations of your work.

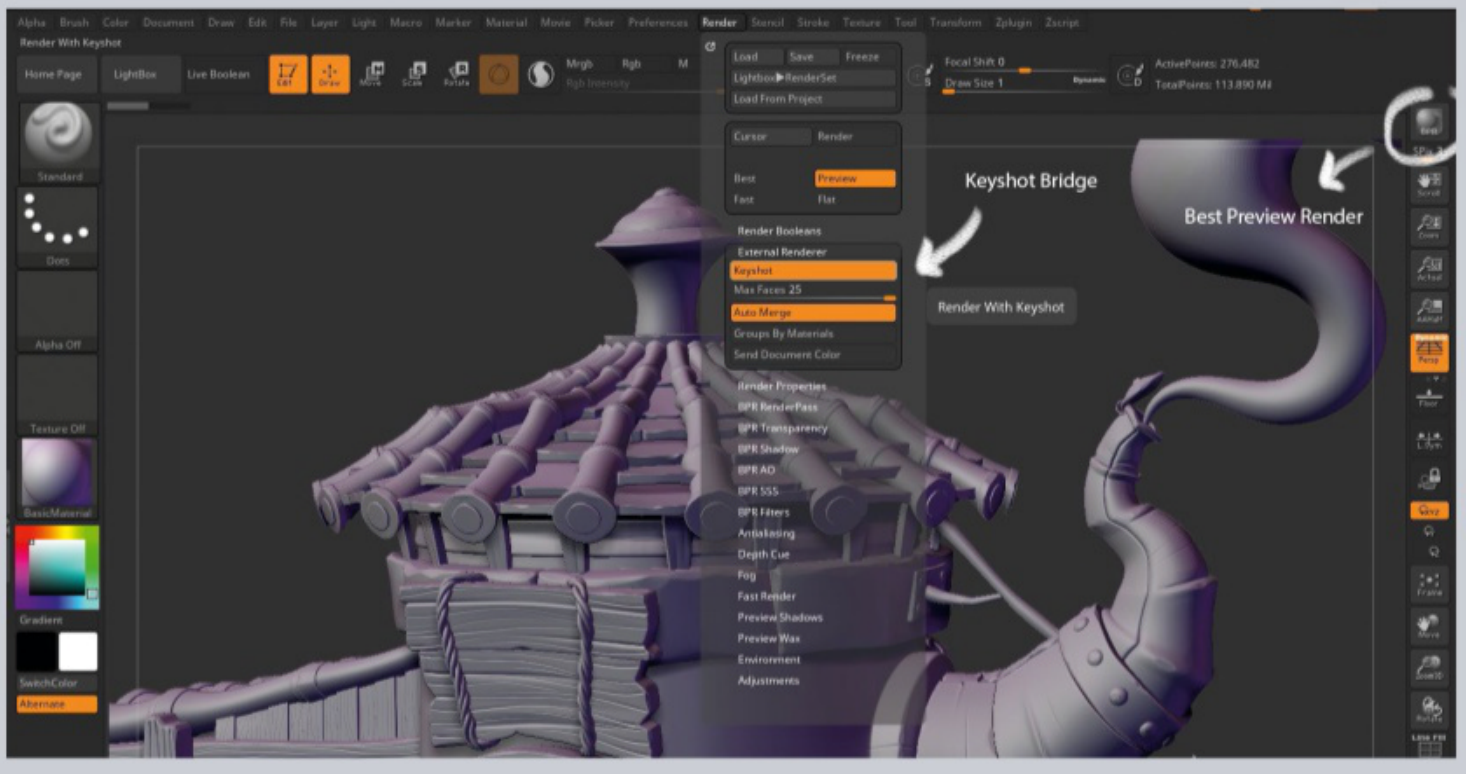


14 MATERIALS AND BASIC LIGHTS

Changing materials while we sculpt is helpful to obtain another perspective of our work. Blinn or Basic Materials have lighting information, so we can add lights, move them and play with the tones to see how they affect our sculpt. Combining both warm and cold lights will give your scene a new feel. You can move their location and intensity to simulate key lights and fill lights.

15 EXPORT WITH KEYSHOT BRIDGE

Finally, we can use the KeyShot Bridge to get nice renders outside ZBrush. With the help of the Bridge, we can send Polypaint information without the need for UVs in the scene, which is very convenient when we need faster results. In the Render menu, we choose External Renderer and then KeyShot. After that, once we press the BPR button (Best Preview Render) ZBrush will send the entire scene to KeyShot. •



3DS MAX | CLARISSE IFX | PHOTOSHOP

CREATE A DETAILED SCI-FI CITYSCAPE

Achieve expert-level realistic 3D concept art of a highly detailed cityscape

CITY RIG SYSTEM
Following the same process as this tutorial, we can create a variety of vivid imaginative worlds

AUTHOR

Haimeng Cao

Haimeng Cao is a concept artist who works in the film and game industry.
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In this tutorial we will go over the entire process of creating a highly detailed sci-fi cityscape by using Photoshop, 3ds Max and Clarisse iFX. First of all, our focus will be to use realistic photo references and refine a unique visual shape language from sketching. Then, we can start to make models based on concept sketches in 3ds Max. From this point, we need to make dozens of different objects in the scene for Clarisse iFX to create highly detailed effects with variations. After that, we import models into Clarisse iFX to organise the composition and render the final image. Photoshop will then be used to add extra details and an appealing atmosphere.

In this process we will cover aspects of design language, 3D modelling, architectural structures, matte painting and visual storytelling. You may also find some useful tips for illustration composition, creative research and concept design. Use your imagination and create fantastic environments in the world of games or films!

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/3DW-255

01 RESEARCH PHOTO REFERENCES

Research is always the first step before you begin sketching and modelling. The goal of this project is to create a highly detailed sci-fi cityscape. When I started to research, I found out that rig systems had the visual information I needed. The colours of the rig are functional in that they separate the different working areas, the forms and shapes are symbolic, and the details evoke a contrast of simplicity and complexity. These elements work for the theme of this project.

02 BRAINSTORM SKETCH

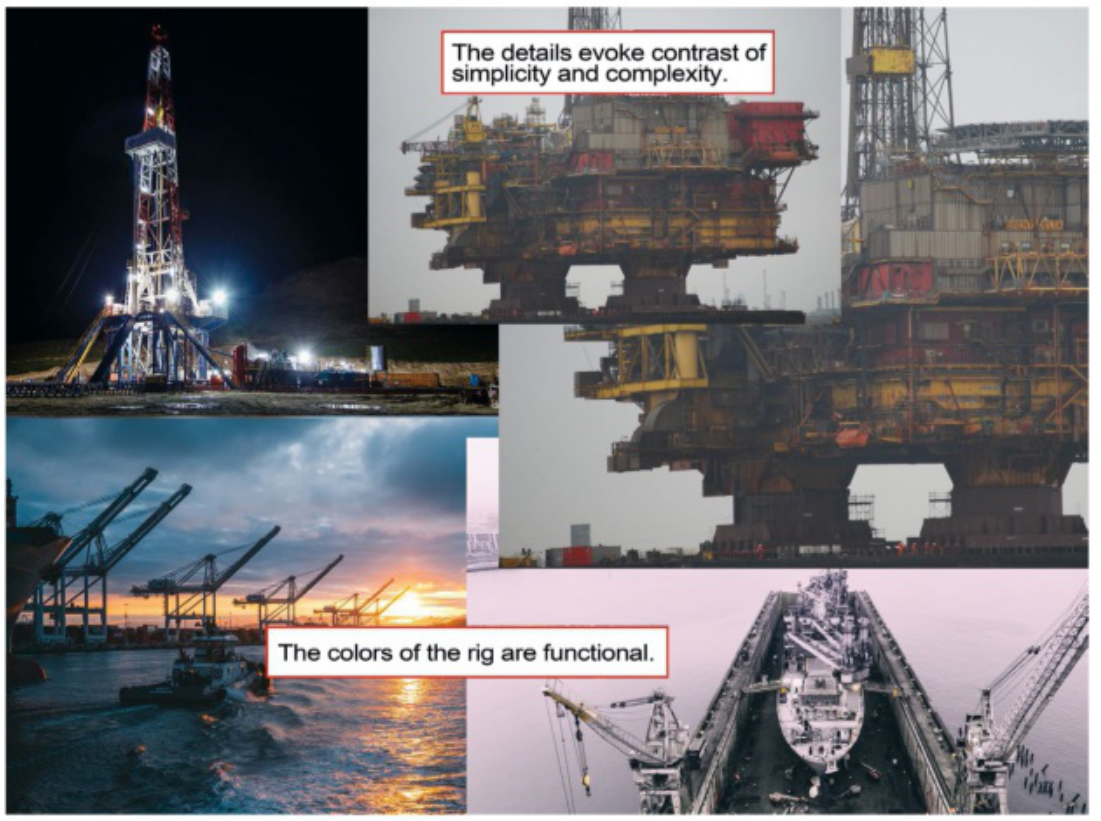
Using the realistic rig photo references, I sketched thumbnails to further explore the concept, including vehicles, architectural structures and compositions for the final images. It's important in this step to free your mind and come up with as many ideas you need, and think deeply about the world you are creating. What are the surrounding elements of the rig? What is the major function of the structure? What kinds of cargo do ships carry? What kind of atmosphere does the scene have? What are the potential stories? These specific questions support the brainstorm sketches and the direction of the project, and it will enable you to establish a more believable world.

03 STRUCTURE ANALYSIS

By looking at the sketch thumbnails and photo references, the rig structure has big, firm support to hold the major platform. Several helicopter landing pads surround the base, and their colours separate the purposes and functions. The cargo area has general supplies for the crew, the power stations are responsible for the electricity of the platform, and the gasoline tanks reserve the fuel that generates from the drill. The drill rig is for extracting oil, the heavy machine is for craning cargoes, the parking areas are for aircraft, and the control room is for operations and monitoring. These are the functional elements that bring the interesting visual information for the scene. The modelling process will focus on these objects.

Build your 3D kit library

As a 3D or concept artist, it is necessary to build your own 3D kit library to accelerate the modelling process. You can buy them from other artists or create them yourself.



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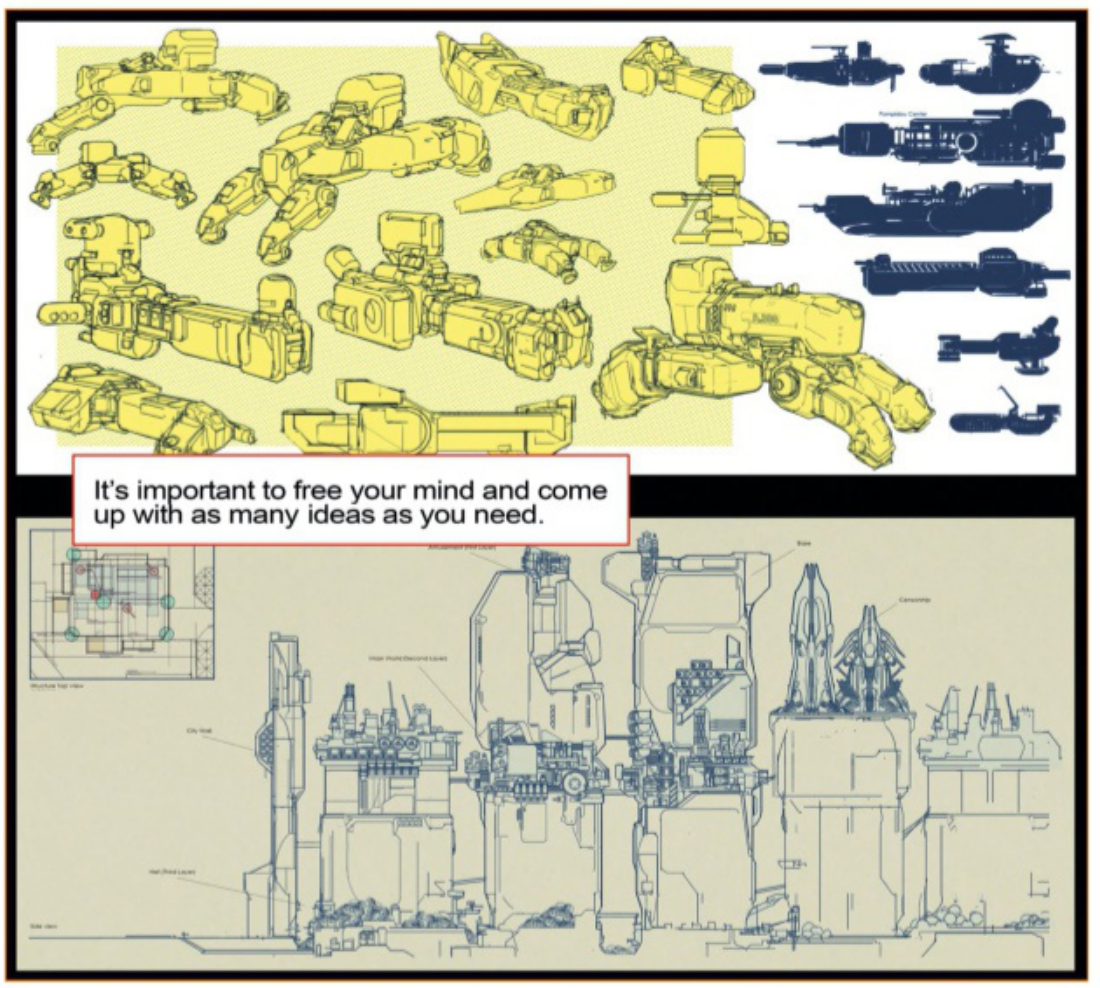
All images for this step: Unsplash



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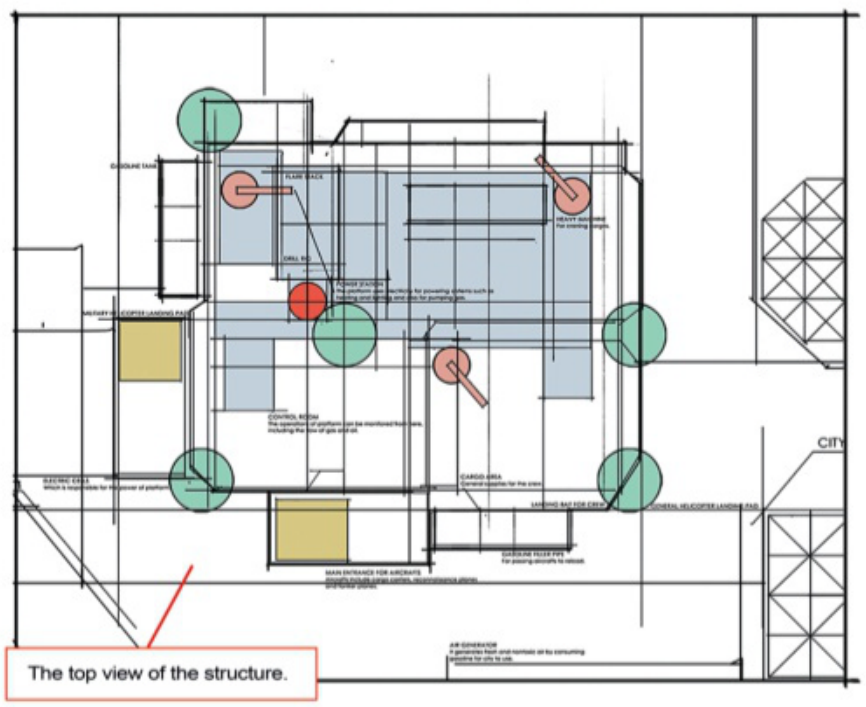

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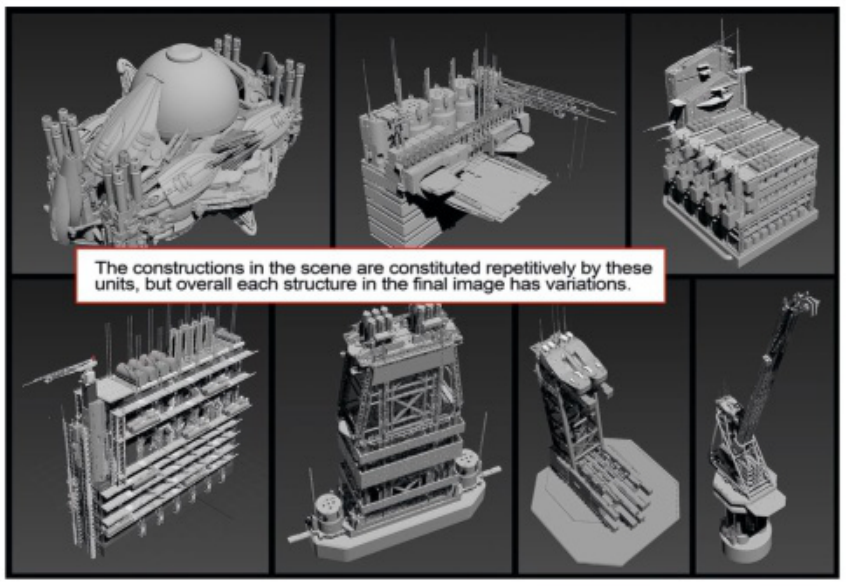
04 MODEL THE RIG'S STRUCTURES

We can now start to block out models in 3ds Max. The goal is to make dozens of object units, and those models are made as detailed as possible. The constructions in the scene are constituted repetitively by these units, but overall each structure in the final image has variations. The rig is the focal point of the composition, and



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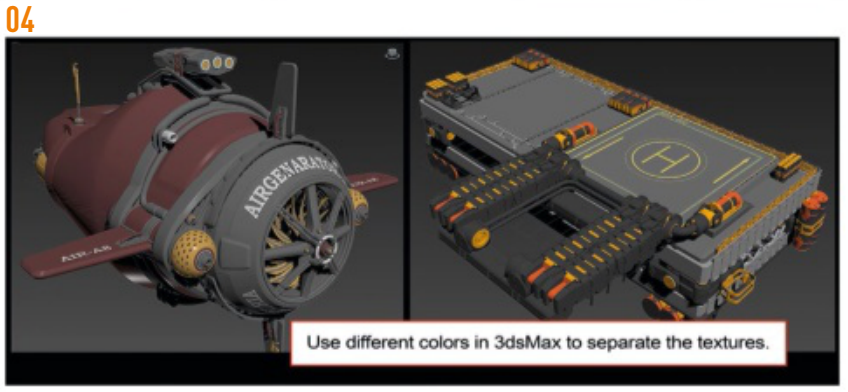

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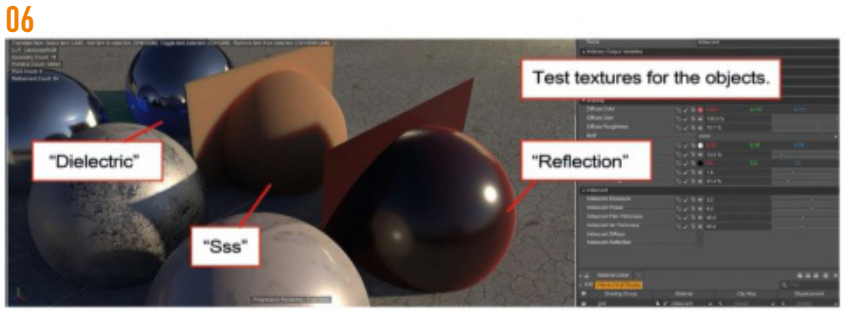

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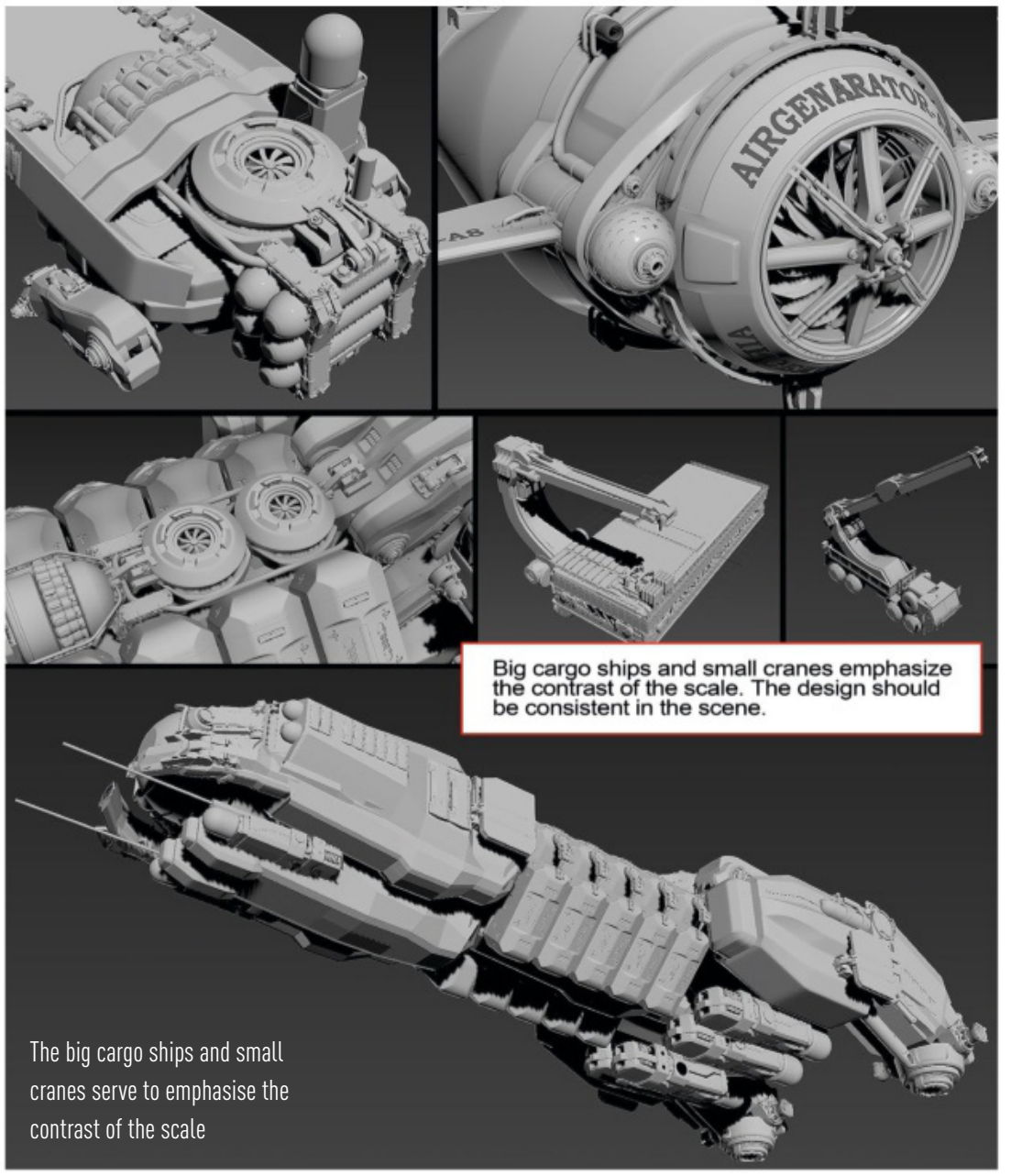


The big cargo ships and small cranes serve to emphasise the contrast of the scale

05

the goal is to make it as interesting as possible. Pay attention to the small structures and details, such as stairways, handrails and power batteries. These are the visual devices that will engage audiences with the concept and make the image's story believable.

05 CREATE THE SURROUNDING ELEMENTS

Surrounding elements are important to enrich the scene, and the arrangement of these objects not only serves the focal point but also provides secondary information to the story. Big shuttling cargo ships and small crane vehicles on the platform emphasise the contrast of the scale and distance. The shapes and forms of the surrounding elements are supposed to be consistent to the structure of the rig and architectures.

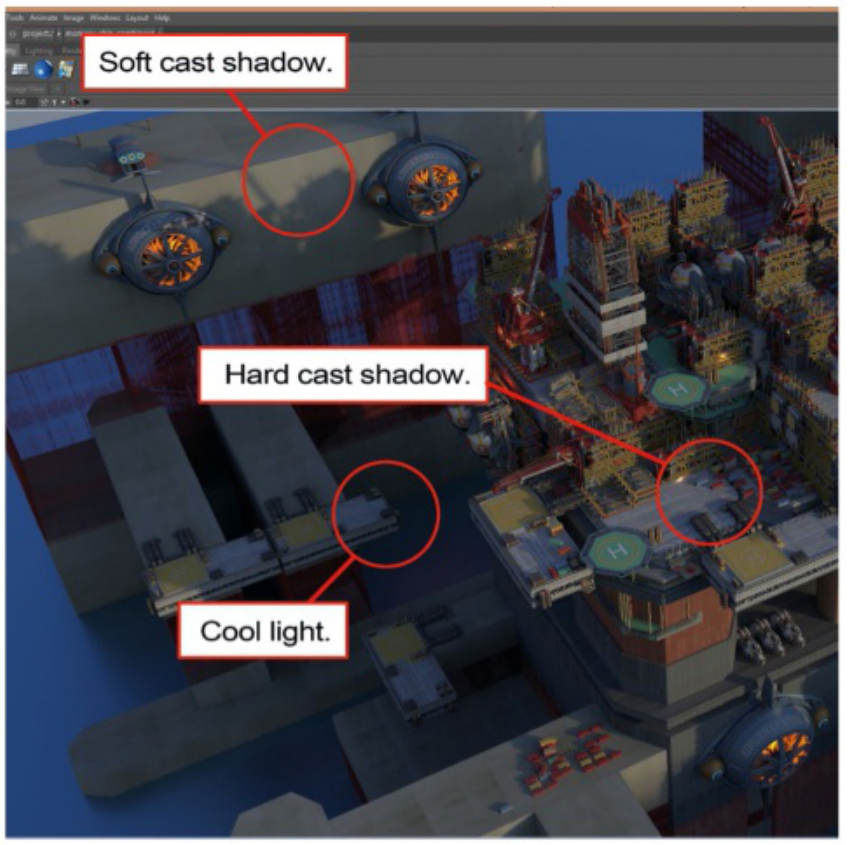
06 PREPARE TO EXPORT

All models are finished and can now be prepared for export into render engine Clarisse iFX. At this step, we need to edit the groups of models and export

Quad Chamfer for hard-surface modelling in 3ds Max

Quad Chamfer is a plugin for 3ds Max, and it works effectively for hard-surface modelling. Select the edges of the objects and use Quad Chamfer to adjust the chamfer amounts of the edges. Use TurboSmooth to subdivide the objects and control the hardness of the edges.

08



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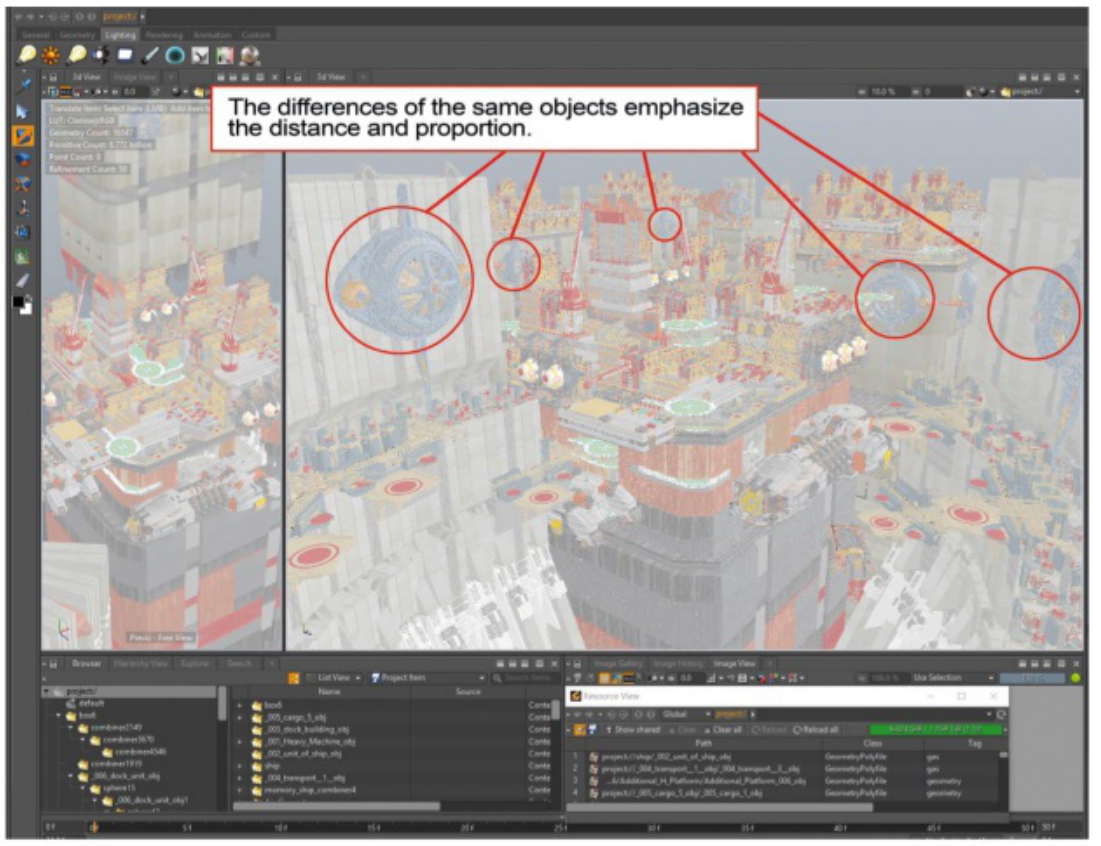


10

them as OBJ files. Since Clarisse iFX is the program to add textures, we only use different colours in 3ds Max to separate the textures. Calculating the amounts and types of textures for each object is important at this step. Naming the OBJ files is also crucial, as it will help you to easily control and organise the scene when importing the objects.

07 TEST AND CREATE INTERESTING TEXTURES

This scene has thousands of objects with more than 30 different kinds of textures. The best technique is to test and add textures before combining and duplicating objects. There are two types of renderers in Clarisse iFX: the path tracer is for physical material, and the ray tracer is for legacy material. The path tracer has better effects and complex manipulations for materials, such as Reflection, Transmission, Layer, Dielectric, SSS and Iridescent.

Layer material could be used for combining different kinds of materials together, adjusting the opacity of each layer to get the desired result. Dielectric material could be used for diamonds. SSS material is for dealing with some special surfaces, such as skin, potato, apple or cream. In this scene, we are concentrating on using material combinations to create believable metal and concrete textures.

Information hierarchy

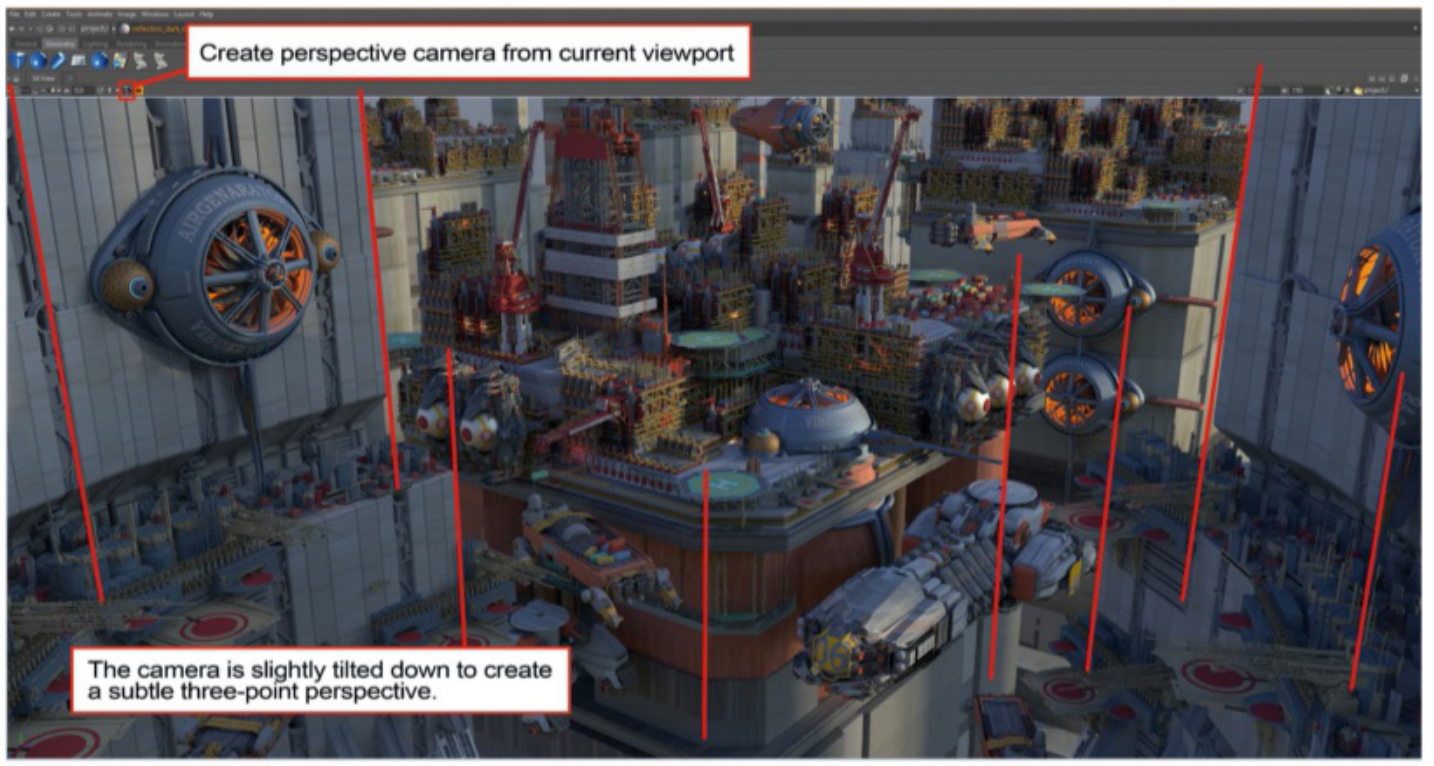
Good composition usually has a clear visual information hierarchy. The focal point is the subject matter of the image, which is on the top of the hierarchy and needs to be supported by the secondary visual information. Reduce the value contrast and desaturate the colours of the foreground/background to bring the order of the information hierarchy back to the composition.

08 GROUP THE MODELS IN CLARISSE IFX

When finishing the export and naming of the objects, we shall start to import the models into Clarisse iFX. The program has three ways to edit the groups of objects: Group, Combine and Contextualize. Since we are creating an epic, highly detailed scene, naming and grouping the objects with clear purposes helps you to efficiently control the scene and generate Alpha images later. For example, the 'Cargo Clusters' group helps to duplicate cargoes on different platforms, and the 'Foreground Architectures' group helps to shift the foreground elements and organise different compositions. The groups of 'Surrounding Aircraft' are frequently utilised to adjust the positions of aircraft and affect the composition of the image.

09 ATMOSPHERE AND LIGHT

Clarisse iFX has a realistic image-based lighting system that helps artists to achieve an appealing atmosphere. Our main subject matter in the centre of the image is surrounded by giant architectural structures. The extremely far structures block the light source and project highly soft cast shadow to the subject matter, whereas the adjacent buildings bring hard cast shadow to the rig. The interesting value contrast is made by the softness and hardness of the shadow.



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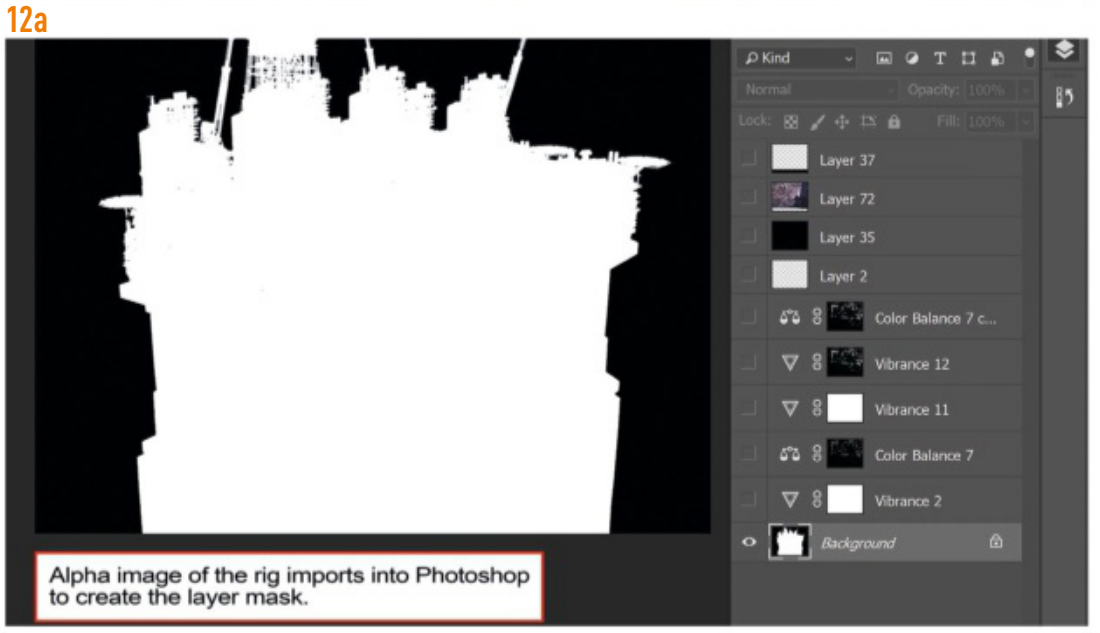

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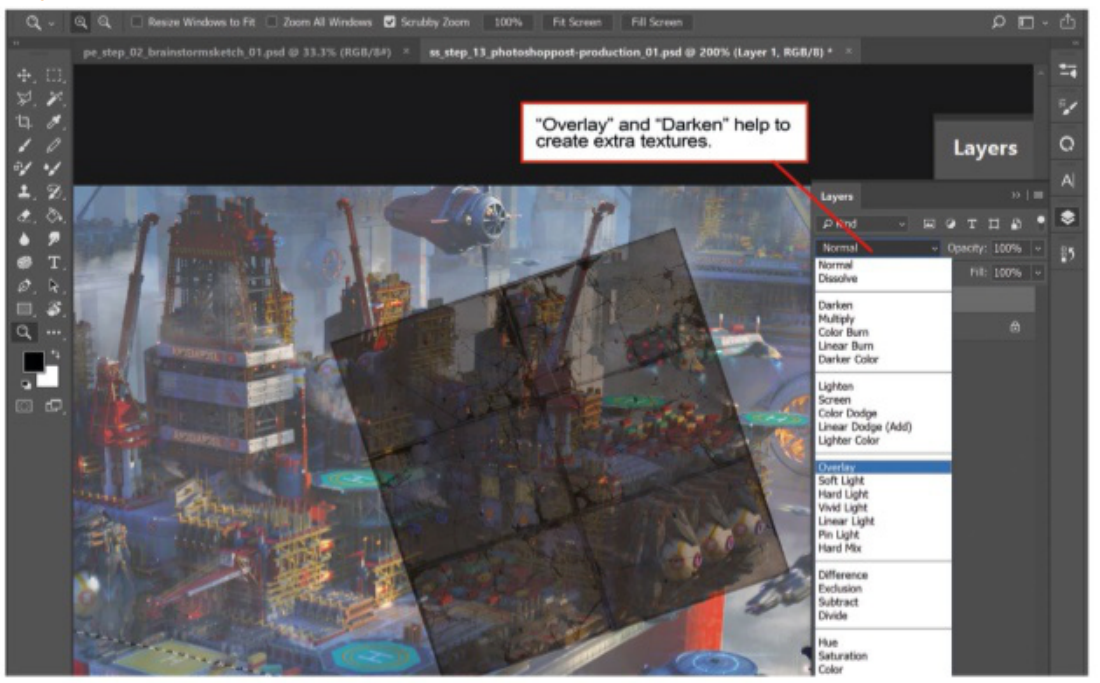

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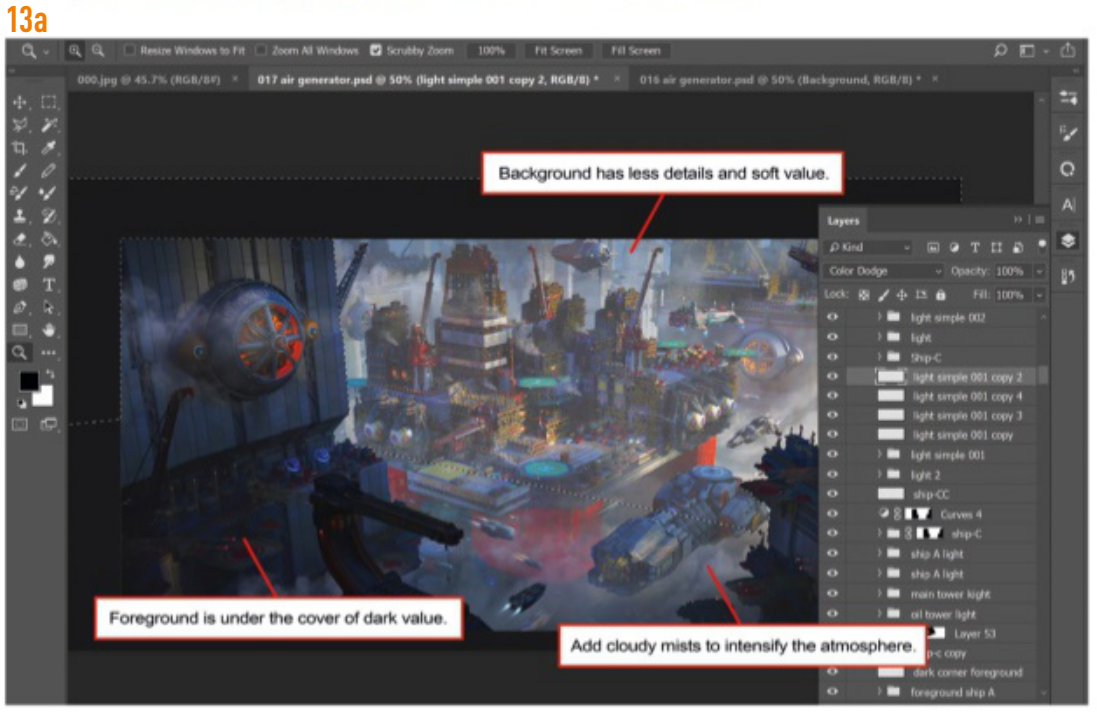

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Reduce render time in Clarisse

These tips are useful for reducing the time it takes to render:

- Lower the Sampling Quality of all the lights and materials, including Diffuse Sampling and Reflection Sampling for the materials.
- For the path tracer, lower the Anti-Aliasing Sample Count and change the Anti-Aliasing Filter to Blackman-Harris.
- Lower the Refinement Count.
- For 'Image', change the Sampling Quality to a lower percentage.

10 DISTANCE AND COMPOSITION

When duplicating several same or similar objects to create a sense of distance in the scene, our eyes are sensitive to the same objects in the far and near, so the size differences emphasise the distance and proportion. Background structures have less details and soft value contrast to punctuate the mid-ground subject matter. Foreground structures have interesting visual information. The focal point rig is fully expressed by the composition.

11 RENDER THE FINAL IMAGE

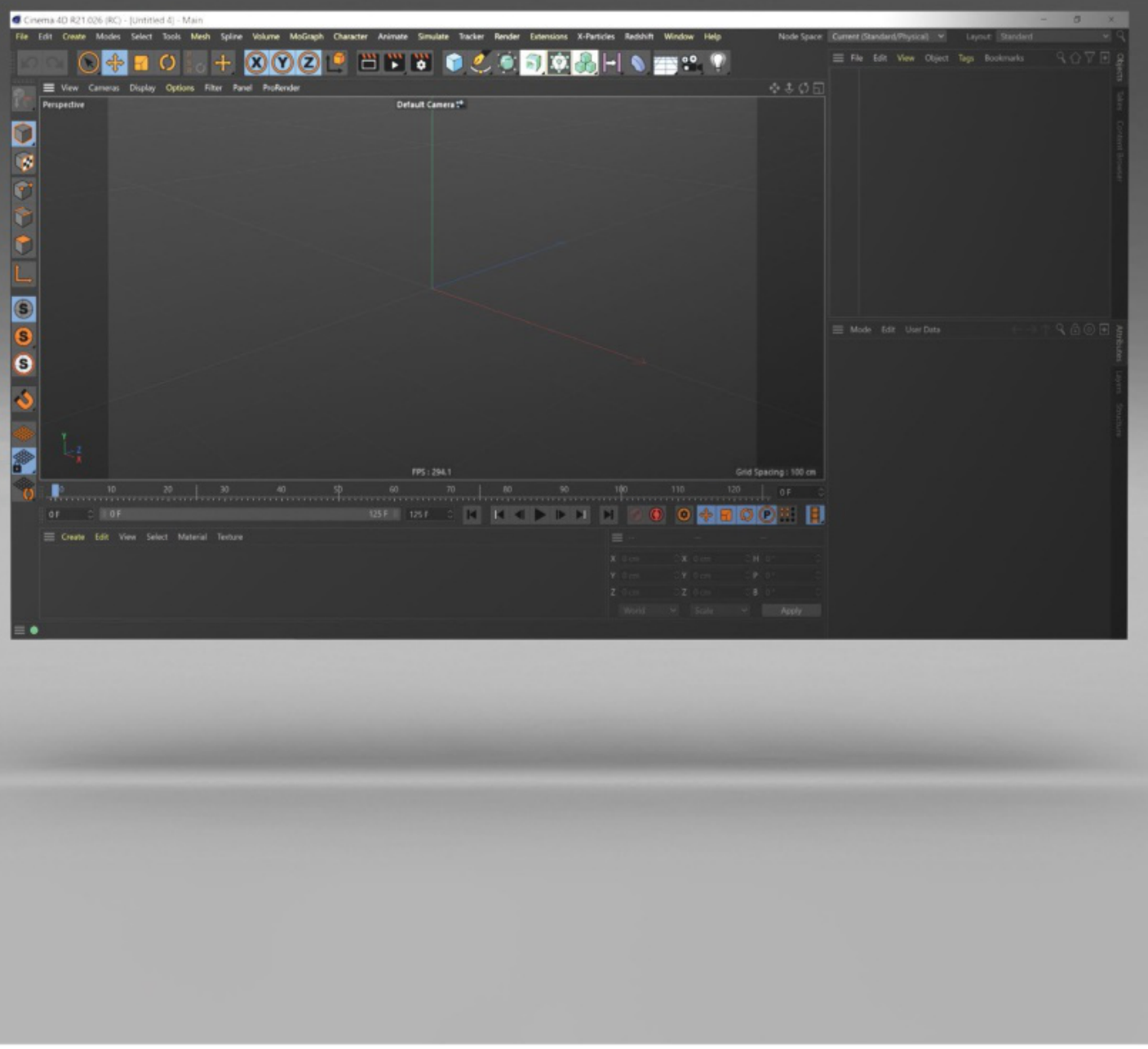
Clarisse iFX has different types of shade modes. The Simple Shading mode is a quick way to view the scene when adjusting models. Progressive Rendering helps artists to directly see the real-time scene. This type of shade mode requires at least one light in the environment, or it will be dark. The camera is slightly tilted down to create a subtle three-point perspective.

12 ALPHA IMAGES

Alpha images are necessary for creating layer masks in Photoshop. The models are clearly grouped in the previous steps, and we shall use those groups to generate Alpha images with the 'Constant' shade mode. This only renders the flat surface of the models, and enables artists to render the Alpha images.

13 POST-PRODUCTION IN PHOTOSHOP

Once we have the final rendered image and Alpha images, Photoshop is the last tool for us to use for adjusting textures, lights and colour saturations. Use Alpha images to separate the objects by layers, and add cloudy mists to intensify the atmosphere. Layer techniques such as Overlay and Darken help to create extra textures. Reduce the details of the far structures. Select the blue sky light with Color Range and strengthen using Hue & Saturation. The colours of the helicopter landing pads and the base of the rig are emphasised to aid the composition, and the tiny signal lights work well for the atmosphere. After this, the final work is done.



3D BASICS

CINEMA 4D BASICS

We continue our look at the core digital content creation applications; this issue, we focus on Cinema 4D

If you are new to computer graphics, there are far too many tools to choose from in a dizzying array of software. This series aims to break everything in CGI down to the very basics so that every artist can be armed with the knowledge of which tool is best. This month we take a look at Cinema 4D.

Having been on the market for nearly 30 years, Cinema 4D from Maxon has developed into one of the most popular digital content creation applications. Cinema 4D has a reputation for being the 'easy' 3D software. While it definitely has one of the lowest learning curves, it is also one of the most in-depth 3D applications, able to handle practically any task thrown at it on both Windows and Mac.

One of the reasons that Cinema 4D has gained global traction is the relative ease of use with its clear and straightforward interface. For many artists Cinema 4D has an industry-leading Object Manager that allows you to see an object, its relationship to other objects, and what materials and other attributes are applied to it.

Cinema 4D has a full feature set including sculpting and modelling workflows, plus a volume modelling system. This is an excellent way for new 3D artists to create models. Cinema 4D also has a full dynamic system, and an advanced deformers system that can work across volume modelling and MoGraph to name but a few.

Cinema 4D has rock-solid reliability when used without third-party plugins, and even then the plugin community for Cinema 4D strives to work hard to create offerings that try to match Cinema 4D's ease of use and reliability.

With an integrated external system that can use other machines for external rendering, and a much lower price of entry with the recent release of Cinema 4D R21, Cinema 4D is an application that will continue to last for decades into the future. Let's take a look at some of its important features.

AUTHOR

Mike Griggs

Mike Griggs is a 3D and visual effects artist with vast experience across the industry, as both a creator and a technical writer.

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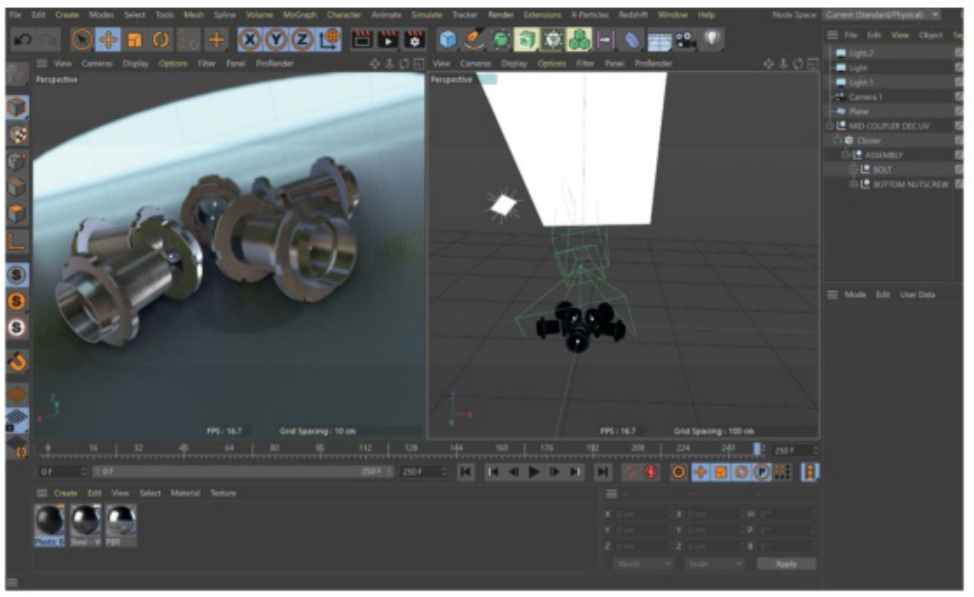
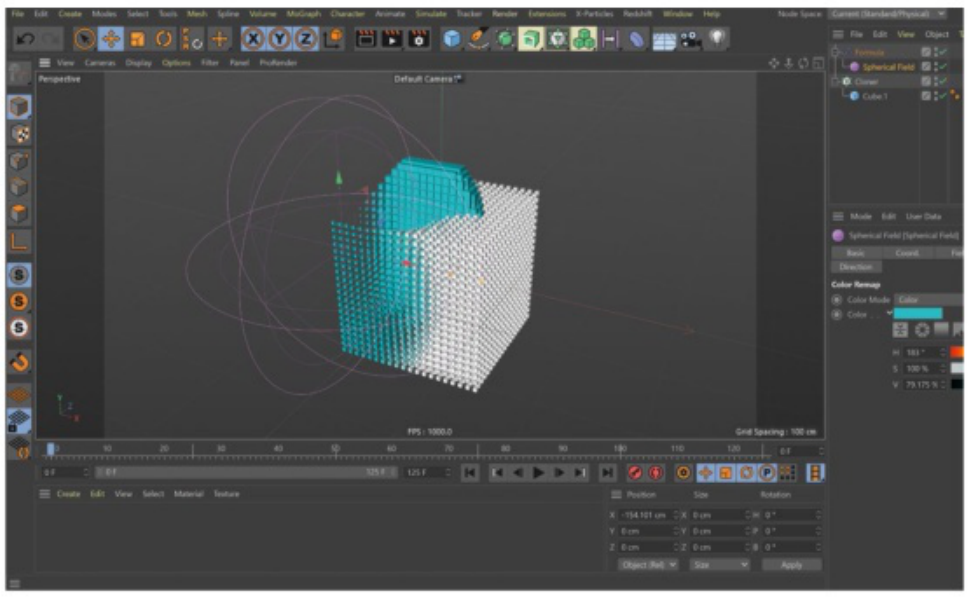


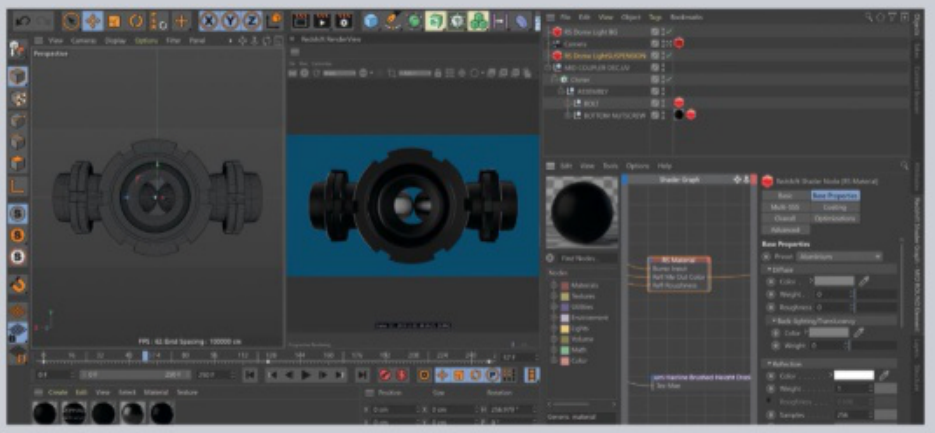
01 THE CINEMA 4D UI

Cinema 4D's user interface is one of the cleanest in the 3D market. Tools are along the left and top of the screen, and the Object Manager shows the visibility of an object along with the materials and various options or 'tags' applied to it. The Object Manager also uses a logical parenting system, which works with practically any element within Cinema 4D. For example, to make a clone of an object, just move it to 'under' a cloner object, then combine with Cinema 4D's procedural modelling tool.



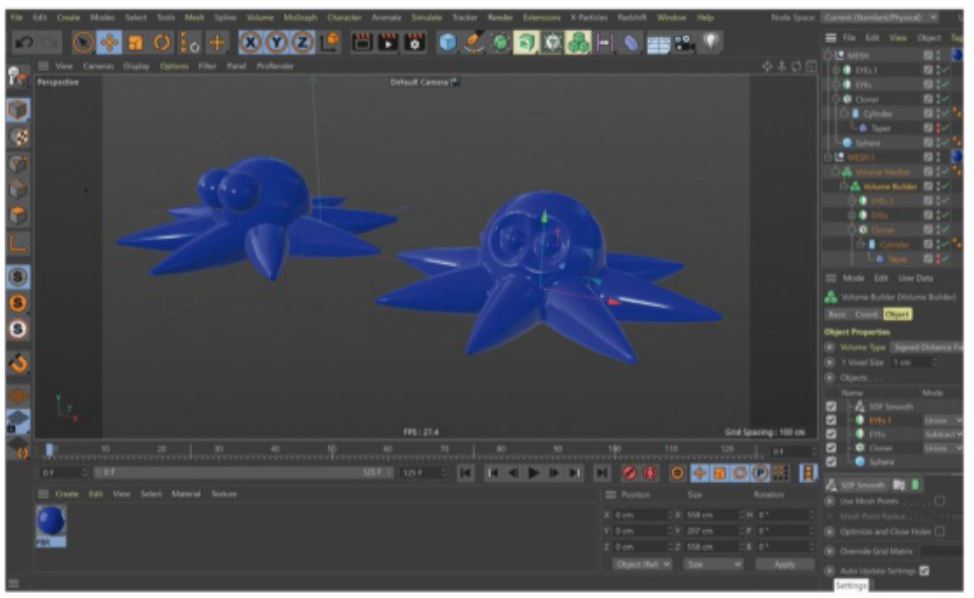
02 MOGRAPH

The Cinema 4D MoGraph toolset is a deceptively powerful system that allows an artist to create complex cloning and movement effects without any keyframes. Cinema 4D allows any object to have a cloner applied to it, whether it is a series of clones or an individual object. With the new falloff system, which has been introduced since R20, Cinema 4D makes it even easier to create complex animations in seconds, which can be easily manipulated by an artist of any skill level.



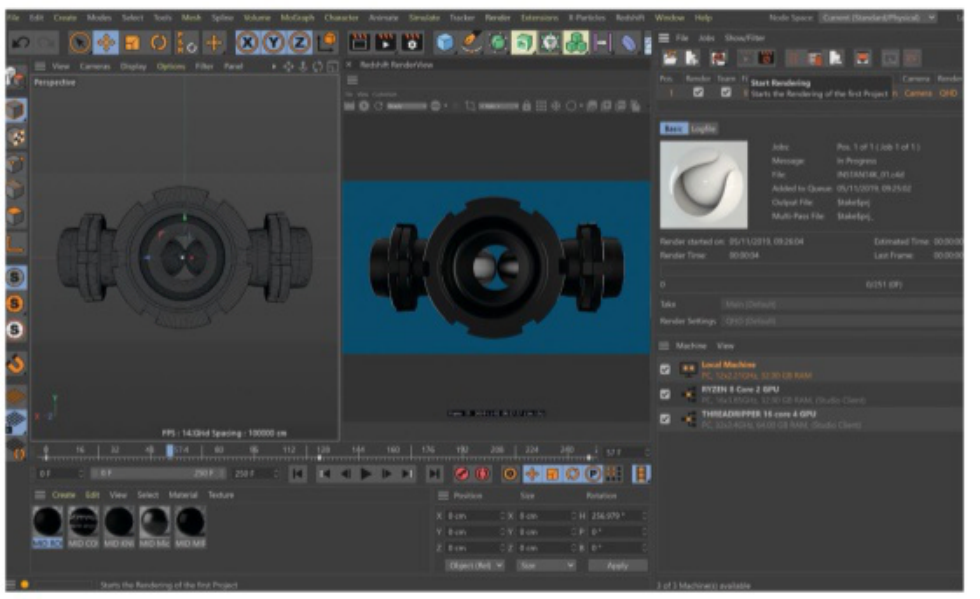
REDSHIFT INTEGRATION

Maxon recently made a big splash in the world of 3D with the acquisition of Redshift, the GPU-accelerated renderer. Redshift has taken the industry by storm in the past few years with its blazing-fast speed and integration across many 3D applications. The combination of the Maxon and Redshift engineering teams will mean that Cinema 4D will be the first-party application for Redshift, and it will also mean that Mac users will get a native Redshift that works as well as Cinema 4D has always done on the Mac.



03 VOLUME MODELLING

Maxon has continued to work hard at improving Cinema 4D's modelling toolset. One of the stand-out features is the volume modelling system which converts meshes into volumes that can be mixed, cut and intersected, and smoothed with a Boolean system, which can make it easy for artists to create complex organic shapes quickly. When re-meshed, volume models can then be edited with other tools within Cinema 4D, such as the sculpting toolset.



04 TEAM RENDER

It could be argued that while many applications offer the same features that Cinema 4D has, they are not as well implemented. A good example is the Team Render system which allows an artist to use up to five machines in their network, whether it is a PC or Mac, to render animations in the background. This is managed either via the render queue from directly within Cinema 4D or via a separate Team Render server application that can run independently. •

3D BOOTCAMP

TRYPOGEN

Discover the plugin for Cinema 4D that can transform meshes into complex abstract forms

Creating abstract shapes in CGI can be a tricky process, especially for new artists. It requires creating something that is both artistic and geometrically stable enough to be used for renders and animation.

Trypogen by Merk Vilson is an inexpensive plugin for Cinema 4D. It allows an artist to take an existing mesh, whether procedural or a polygon-based object, and transform it into a beautiful abstract shape with a drag and drop. Trypogen works with versions R20 and below, and a R21 version is coming.

There are a wide range of parameters in Trypogen that can allow artists to make a Trypogen shape totally unique. Using the polygon setting, for example, turns a single mesh into multiple objects instantly. Depth and thickness can be easily adjusted, as can the variation of the shapes created, and, naturally, these can all be animated.

Adjusting the subdivision of a Trypogen object can allow for the easy creation of hard-surface objects. Trypogen makes selection sets of its meshes so that various materials can be applied.

The plugin integrates well with the standard Cinema 4D workflow and can be used on multiple objects in the same hierarchy.

In fact, Trypogen offers some excellent tools for mixing meshes. The Weld option in the Utilities palette allows Trypogen to blend objects together, which can be really useful for creating unique shapes or large areas of detail.

Trypogen can also work with animated objects, allowing artists to build up a scene with basic shapes. When the time is right to add the desired detail, the Trypogen objects can be activated, allowing a fast animation workflow.

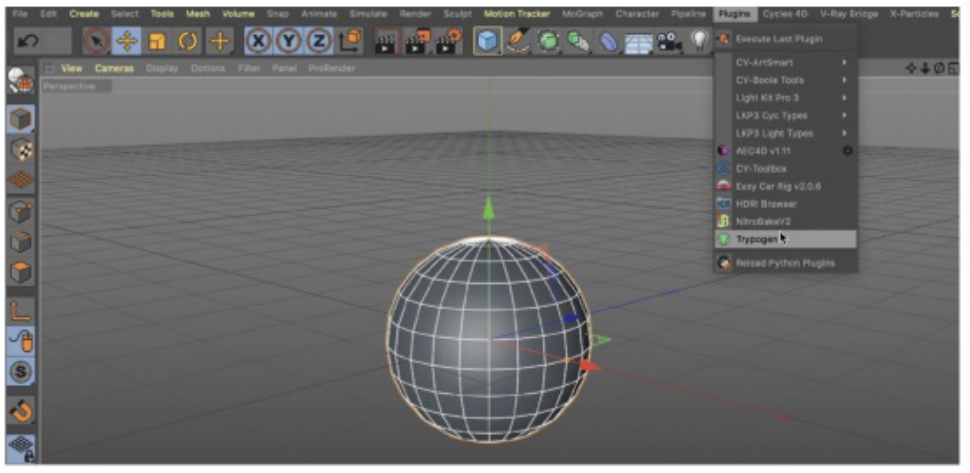
At only $30 Trypogen is a must-have plugin for any Cinema 4D modeller. Let's explore how to use it in a few quick steps.

AUTHOR

Mike Griggs

Mike Griggs is a 3D and visual effects artist with vast experience across the industry, as both a creator and a technical writer.

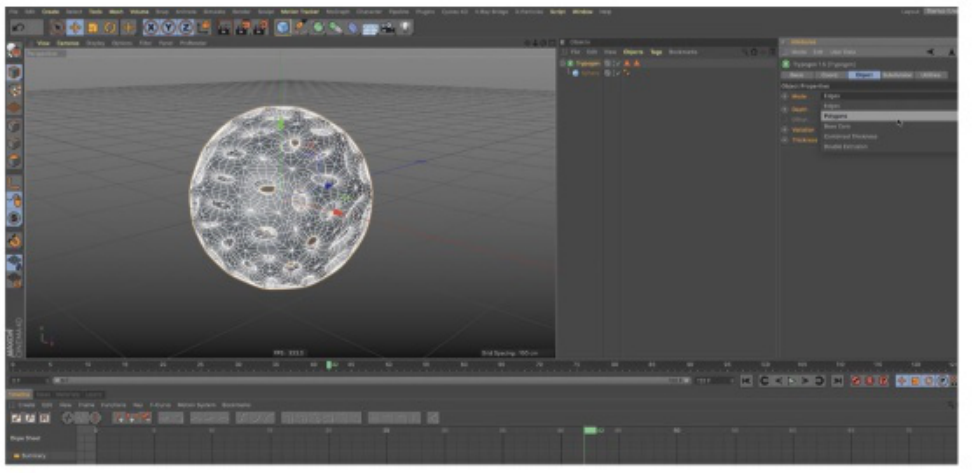
www.creativebloke.com



01 ADD TRYPOGEN TO A SCENE

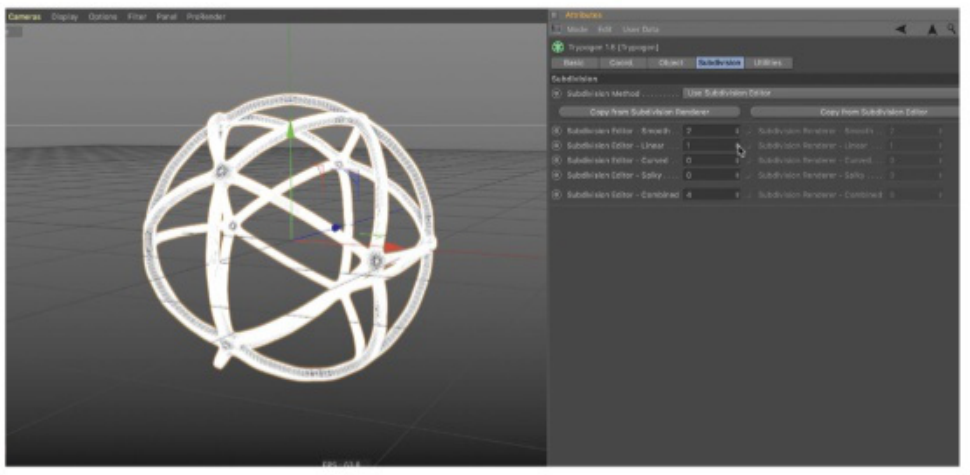
First make sure that Trypogen has been installed in the plugins folder as detailed in the instructions. It should then appear in the Plugins menu. When Trypogen is used, it creates a Trypogen object in the Object Manager.

The plugin works with a standard Cinema 4D parenting workflow, so you just have to drag and drop the meshes you need to use into the Trypogen object.



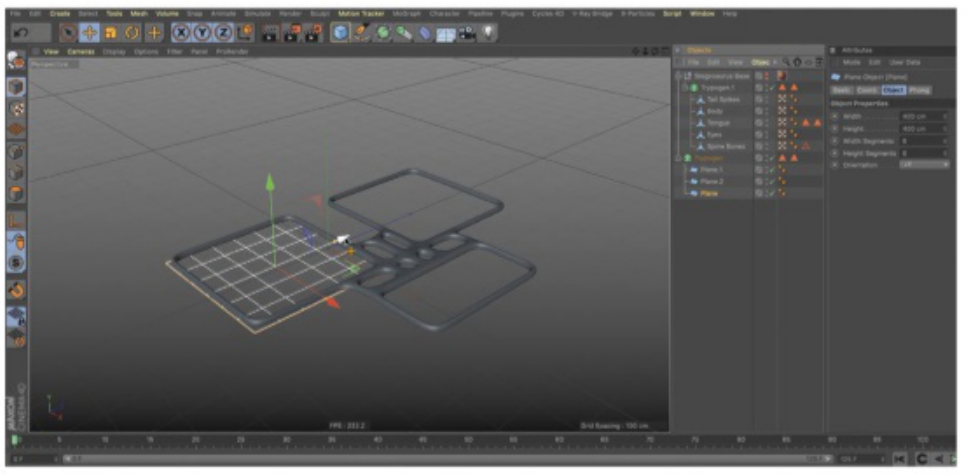
02 TRYPOGEN MODES

The plugin has five core modes to choose from; there is no hard and fast rule as to which one is 'best', as it is totally up to artist discretion. The polygon mode is a great way to create multiple objects from a single object. For example, if a sheet of pebbles is needed, polygons are the way to go. Still, an artist may find the Double Extrusion option better suited for their needs, with its ability to make multiple extrusions from an object, which can be adjusted.



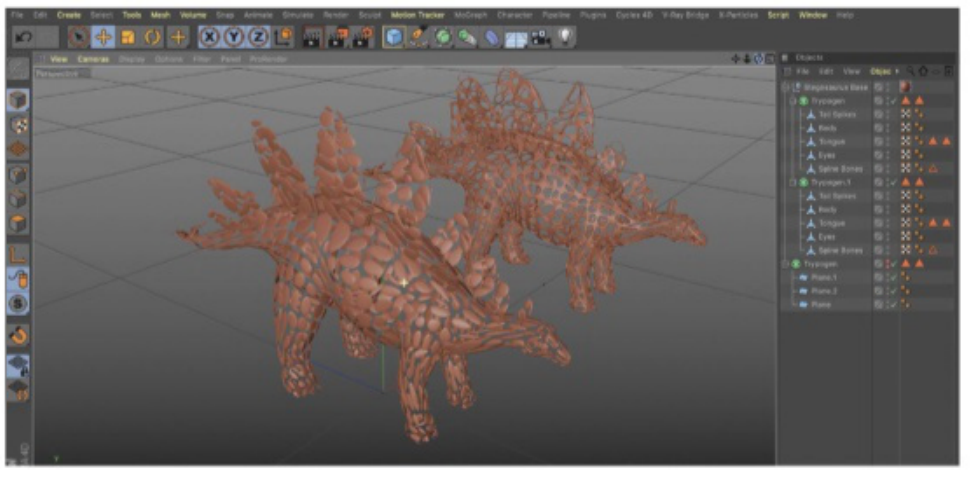
03 USE SUBDIVISION TO REFINE SHAPES

Trypogen is also great for creating unique hard-surface shapes. By using Trypogen's subdivision tools in conjunction with each other, even more complex shapes can be created with ease. The linear subdivision is excellent at creating hard but smooth edges. These edges, when combined with the depth and thickness tools, can create great shapes that can be combined with other objects to create hard surfaces.



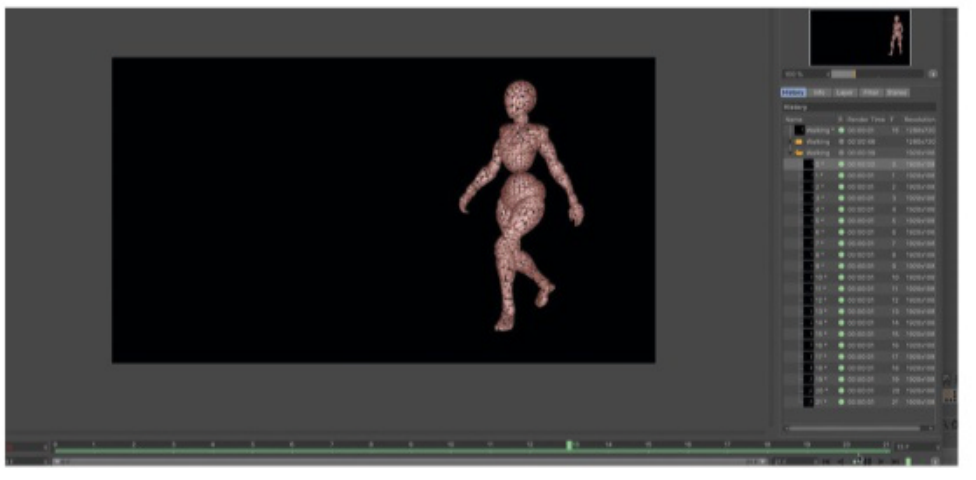
04 BLEND OBJECTS

Trypogen can blend objects to create genuinely unique shapes. Make sure that all the desired objects are under the Trypogen object in the Object Manager and in the Utilities tab, then increase the Weld value until the desired mesh has been created. Moving the underlying meshes does have an impact on the Trypogen object, so be mindful when adjusting the meshes as the slightest movement can have a radical effect on the shape.



05 USE MULTIPLE SHAPES

There can be multiple Trypogen objects in a Cinema 4D scene. This is really useful for creating variations of the same model, especially when a mesh or group of meshes is instanced. Trypogen will work just as well with instances. This means that any changes to the original mesh will be replicated across the instances and can be picked up by the multiple Trypogen objects. This allows a single model to be a driver for numerous unique abstract shapes in a scene.

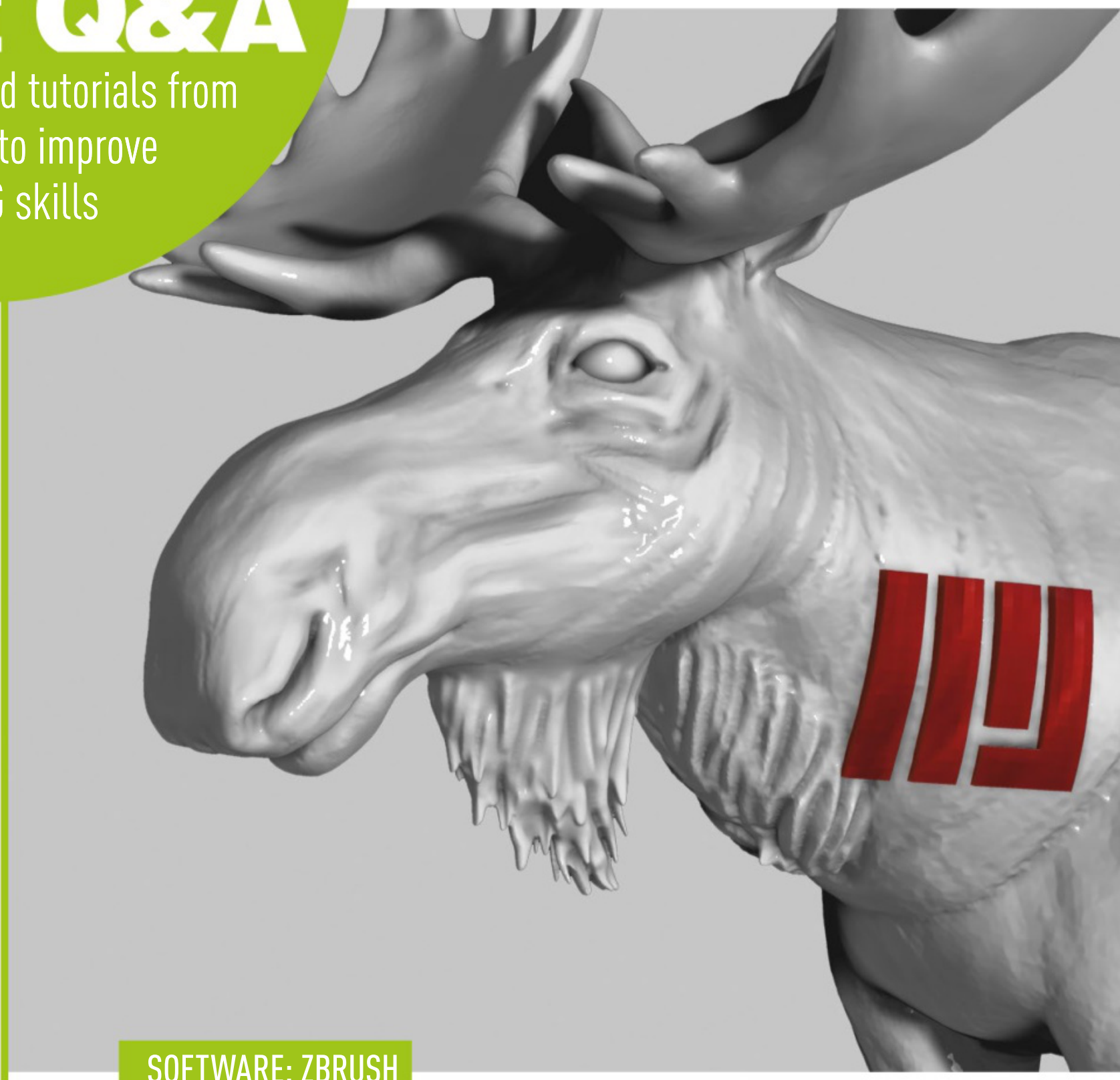


06 ANIMATE WITH TRYPOGEN

Trypogen supports animated objects, including meshes that have been associated with a rig. Study how Trypogen works with an animated mesh as it can vary on deformed meshes, which could be useful for creating unique effects. When used with the polygon mode, a single animated object can create an animated group made of many multiple objects. Simply experimenting is the best bit of using this fantastic plugin. •

Artist Q&A

Practical tips and tutorials from pro artists to improve your CG skills



Maya Jermy
Maya is a 3D artist and animator based in the UK. She started her career in 2012 remaking and animating characters for *Oddworld: Abe's Oddysee - New 'n' Tasty.*
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Oscar Juárez
Oscar is a 3D generalist based in Mexico City. He has been running Fibrha Studio since 2010 and specialises in archviz rendering, animations and Unreal Engine.
www.facebook.com/FibrhaStudio

Pietro Chiovaro
Pietro is an Italian 3D artist who creates 3D assets and environments, and is currently working on an open-source game.
pietrochiovaro.artstation.com

Antony Ward
Since the early 90s Antony has worked for many of today's top game and VFX studios, and has written three technical manuals and many online tutorials.
www.antcgi.com

GET IN TOUCH

EMAIL YOUR QUESTIONS TO
rob.redman@futurenet.com

SOFTWARE: ZBRUSH

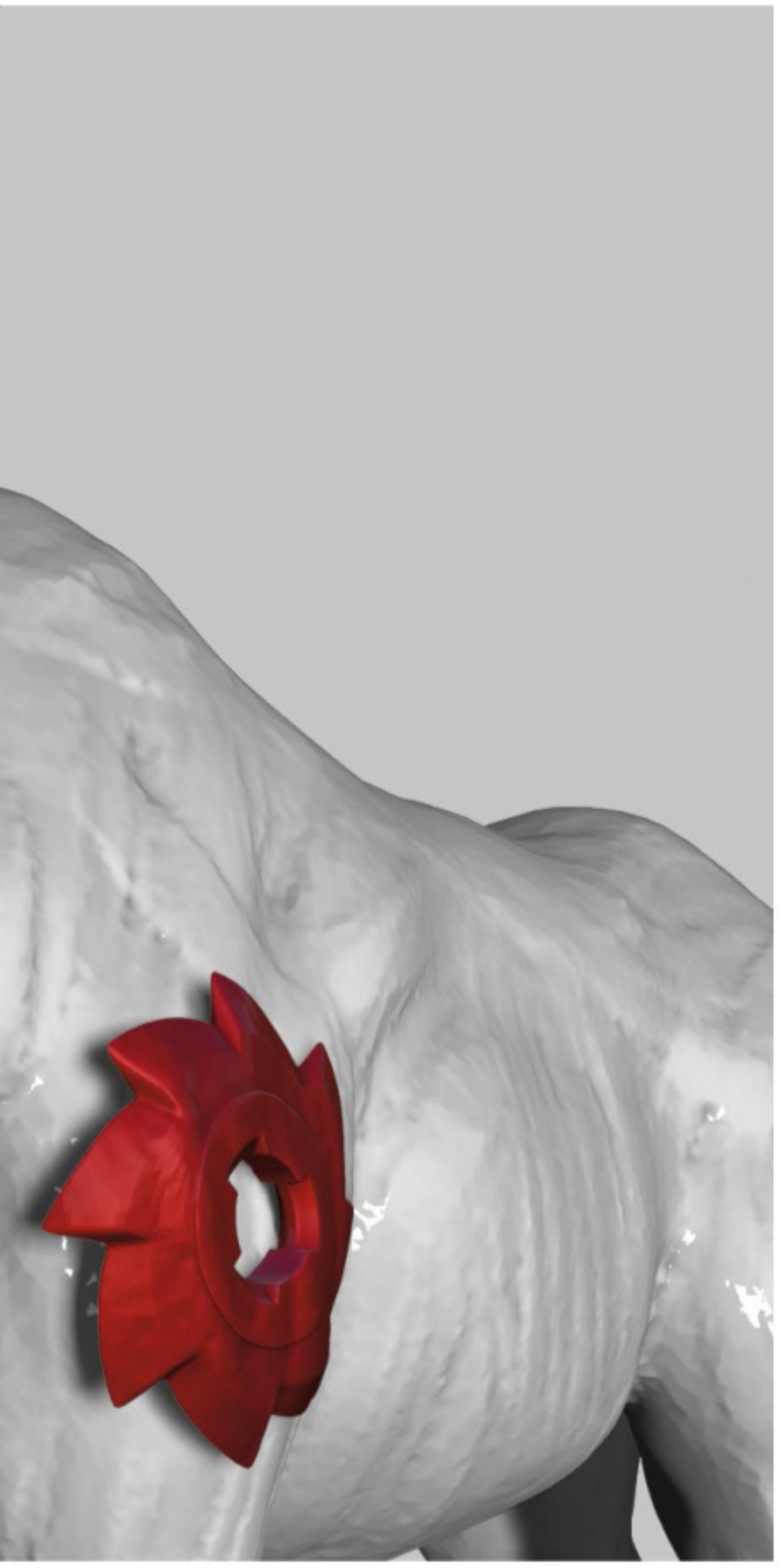
HOW CAN I MANIPULATE A SHAPE TO CONFORM TO OTHER 3D OBJECTS?

Lizzie Thomas, Essex

Maya Jermy replies

If we have an intricate shape we would like to be able to apply to another 3D tool, in a way that it sticks to it and adapts to its shape, we could hit some issues on the way. Resculpting such a complicated design would be unnecessarily time-consuming, not to mention the agony of trying to replicate the pattern perfectly. 3D artists are often pressed for time, so efficiency is key, and nothing improves efficiency as much as knowledge of the tools available to us. Thankfully, the technology we get to use is always being improved, and ZBrush offers solutions to a great deal of problems any artist could face.

The tool with the exact specific mission for the issue at hand is called the MatchMaker. This is a brush that deforms the shape of one object so that it fits perfectly against the surface of another. Imagine that we have a 3D shape (in this case, the gear as seen above) that we want to apply onto another object, for



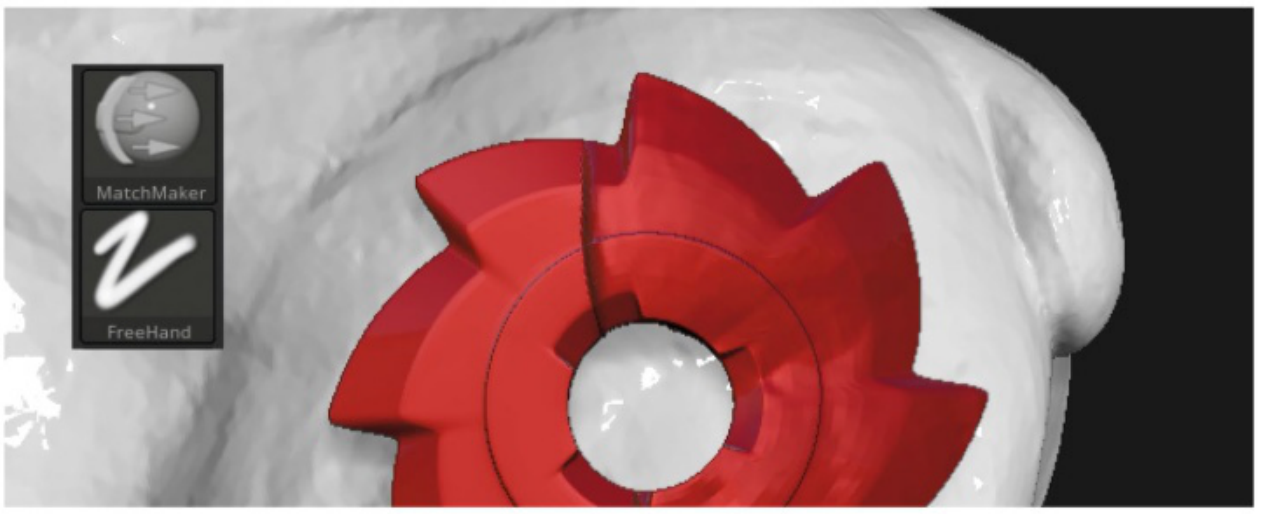
Learn about the tools you have at your disposal in order to work more efficiently

example the moose, and make it align to the character's silhouette. To complicate the process we could increase the depth of the shape, then Boolean the two tools until we get something more or less workable, but it would for sure mess up the topology of the resulting mesh. Of course, we want to avoid situations that add even more work in exchange for poor results. So, let's instead take a look at the MatchMaker and see how quickly we can achieve the desired look.

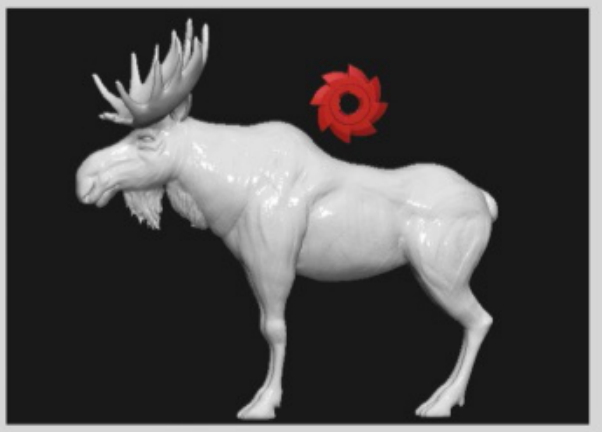
EXPERT TIP

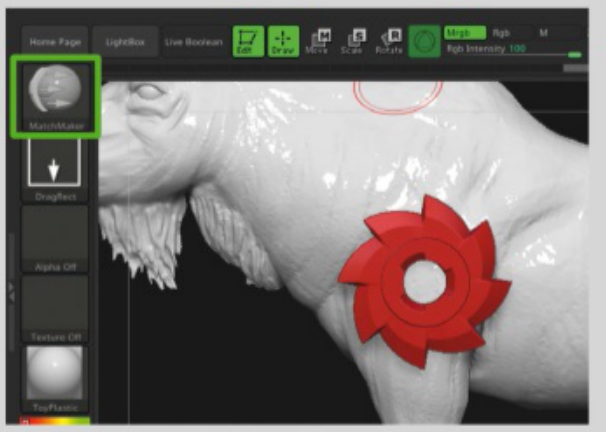
STROKE TYPE

You can change the stroke from DragRect to FreeHand to conform only the selected areas of the shape. Changing RGB to MRGB or M will apply the object's material onto our shape as well.



STEP BY STEP USE ZBRUSH'S MATCHMAKER BRUSH



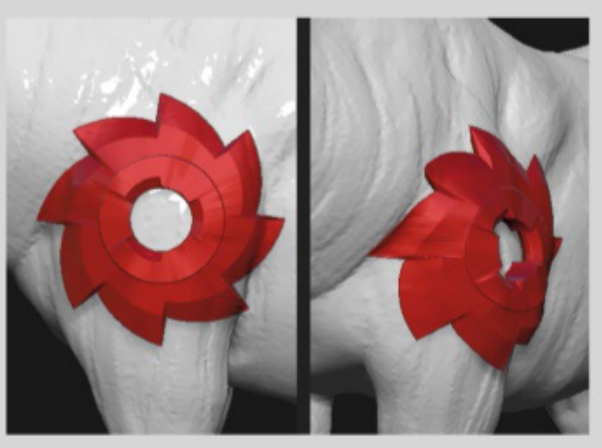


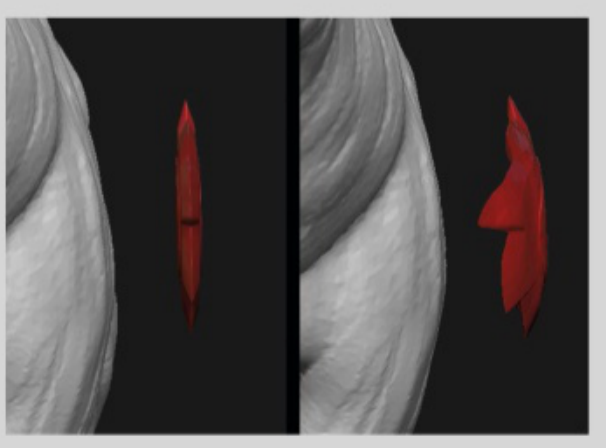
01 PREPARE THE TOOLS

Let's start off by preparing the shape (the gear) and the object (the moose). Align them closely and centre the pattern position for the projection. Use the Move/Scale/Rotate tools to reposition the gear.

02 MATCHMAKER

You will find the MatchMaker brush in the Brush menu, or you can press BMM on the keyboard to select it. You can increase the size and intensity of the brush, but for best results, keep the intensity at 100.





03 APPLY THE STROKE

MatchMaker will push the selected tool (gear) onto the visible tool (moose) based on the projecting angle. To deform the shape evenly, make sure the cursor starts in the middle of the mesh and the view is recentred. Click and drag the cursor out towards the edge of the canvas.

04 DISTANCE ALIGNMENT

Whether you want the surfaces to touch or remain farther apart, you have to align them before using MatchMaker. It will assign the starting point for the deformation. Simply use Move/Scale/Rotate. For different results try using it with Perspective on or off.

FOLLOW THE VIDEO
www.bit.ly/3DW-255

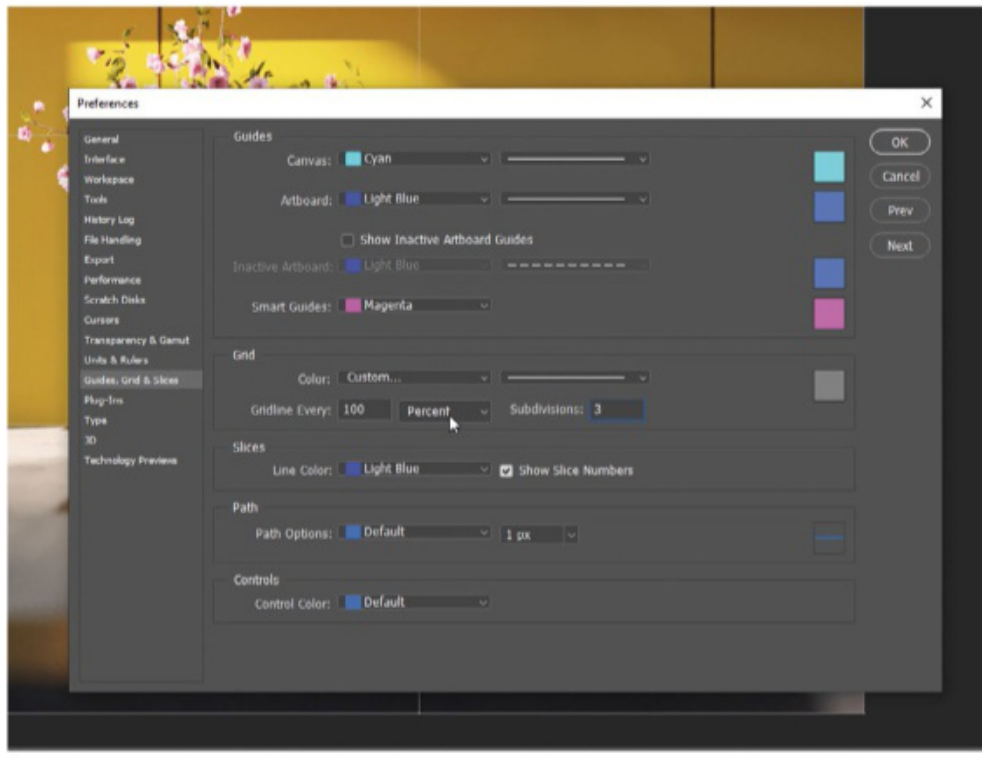
EXPERT TIP

HIDE AND UNHIDE

Once the rule of thirds is set in Photoshop you can hide it by pressing Ctrl+H, using the same shortcut to activate it again.

01

02



SOFTWARE: 3DS MAX | PHOTOSHOP

CAN I SET THE RULE OF THIRDS AS DEFAULT IN PHOTOSHOP AND 3DS MAX?

Billy Williams, Norwich

Oscar Juárez replies

Composition is one of the most important elements to consider when it comes to archviz. We might have an amazing project with so many great ideas, but then our final resulting render just doesn't look so great – this can be due to several reasons, but one of the most common is an unappealing composition. In this tutorial, I will show you how to set the rule of thirds as a default in 3ds Max and also in Photoshop, so that when working in 3D we can have the grid visible in our viewports, and when doing post-production we can have it in Photoshop too. Keep in mind that there are a lot of different ways we can frame our images, but this one is the most common in archviz. So let's get to it.

STEP BY STEP SET THE RULE OF THIRDS GRID TO AID COMPOSITION

01 ACTIVATE GRID

First we will set our grid in Photoshop. As I have said before, having the rule of thirds grid active helps with our composition when working in 3D, but once the render is done and it's time to add more life to it in Photoshop, this is when the rule of thirds comes in really handy. Photoshop has many tools we can tweak to fit our needs and that is exactly what we are going to do. The first thing to do is activate the grid. We can go to View>Show and right there we will see the Grid option. Once activated we will be able to see the grid in our file. It's a pretty dense grid, so the next step is to tweak it so it can fit our needs for the rule of thirds.

02 SET THE THIRDS

We have our grid, so now we need to set the exact thirds we need. We have to select Edit>Preferences and then select Guides, Grids and Slices. A new options panel will pop up. Here is where we need to make some minor adjustments. As you can see there are several options, but the one we need is the one in Grid. We need to change inches to percent, set the Gridline Every to 100 and in Subdivisions set a value of 3 so we can have our thirds ready to work.

Keep in mind that we can hide this grid by pressing Ctrl+H, and it can be activated with the same shortcut.

03 SELECT AND ACTIVATE CAMERA

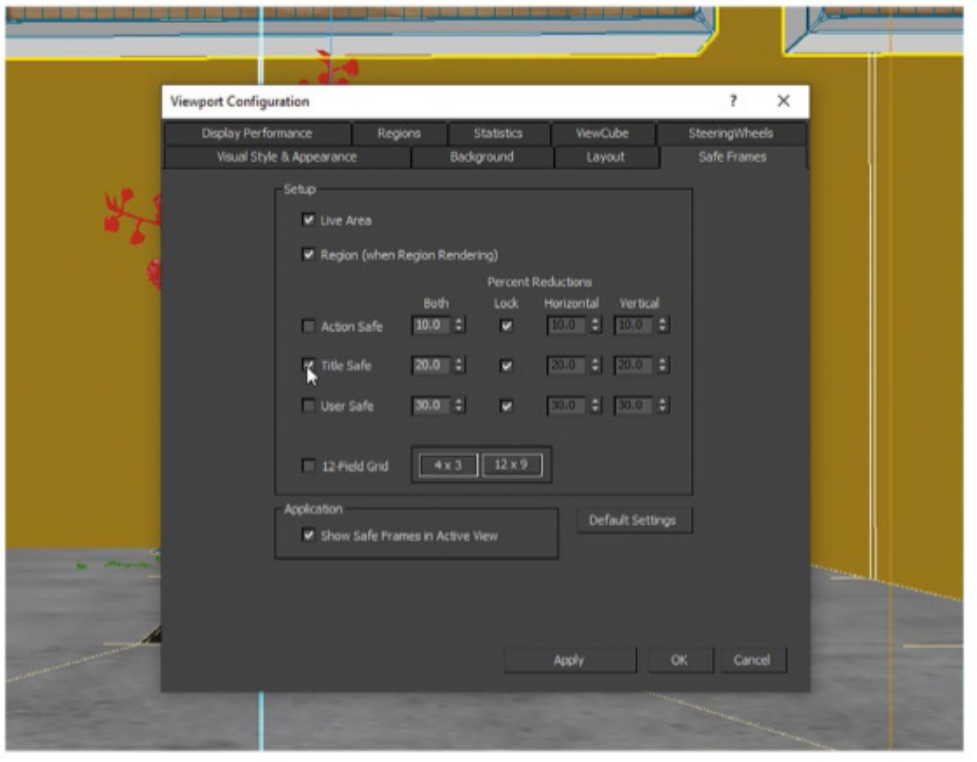
Now it's time to deal with 3ds Max so we can have our grid. As we all know 3ds Max has several ways to help and improve the way we do our compositions, and there are even several plugins made for the same purpose, but in this case we will use only 3ds Max's own tools. So we have to select our viewport, then click the + sign and hit Configure Viewports. Once selected this will give us all the options we need to improve our work. In Layout I always select the 2 divisions so I can have one for real-time rendering.

3ds Max has as a default a two-squared frame in the viewport, but personally I think the thirds work much better. So it's time to adjust the settings.

04 THIRDS IN MAX

In Safe Frames uncheck the lock for Action Safe and do the same for Title Safe. Set 66 and 0 for the Action Safe and do the opposite for the Title Safe, meaning we have to set 0 and 66. Now press OK. Our grid will be ready in our viewports. Always remember you can activate the grid by pressing Shift+F.

03



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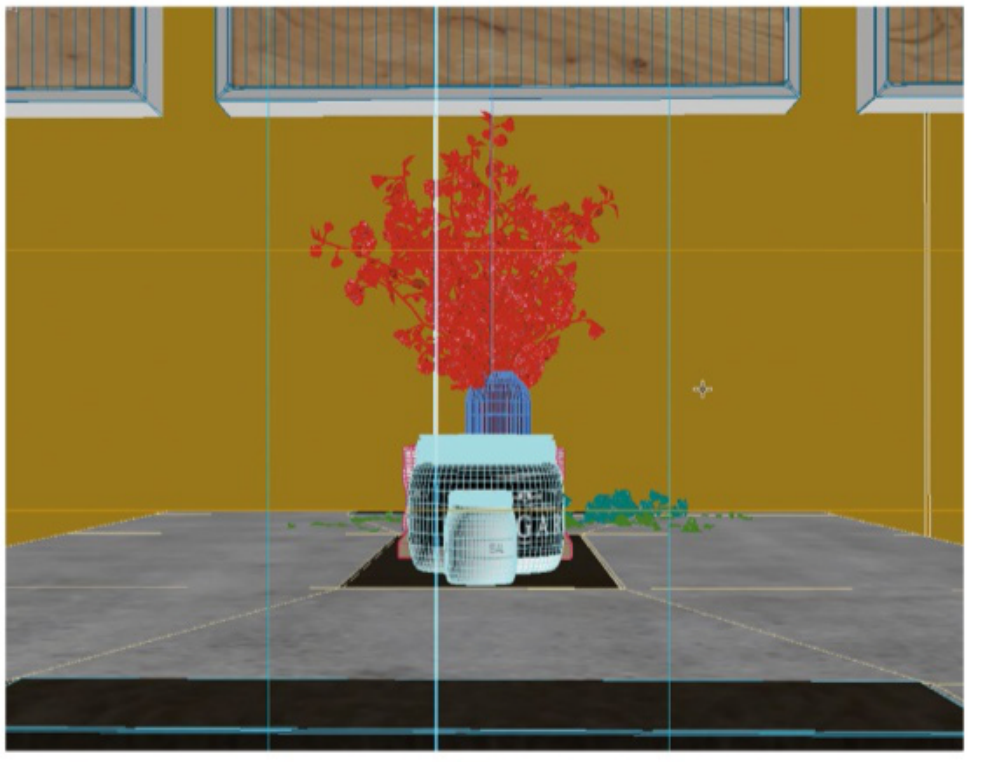
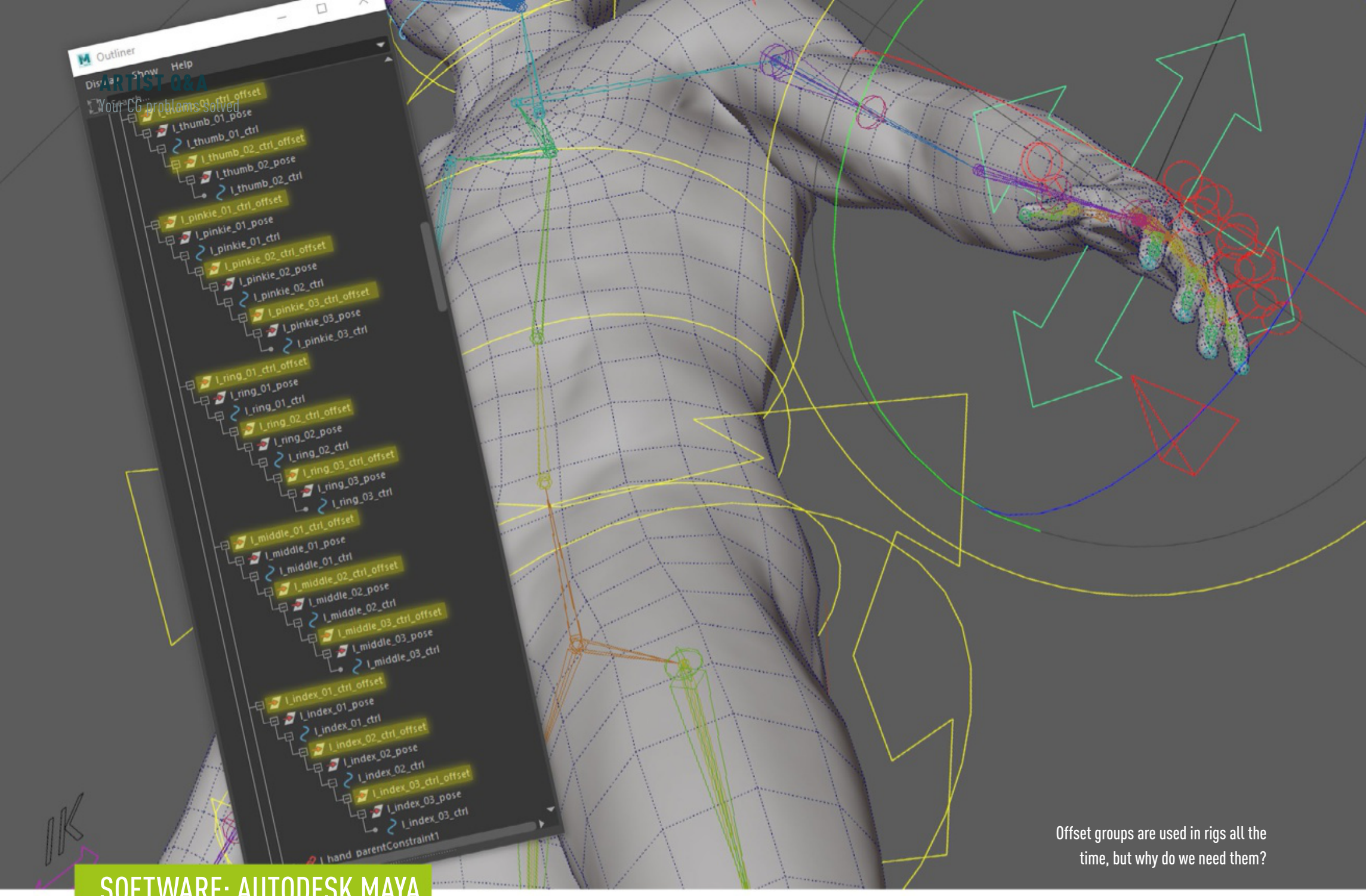




Offset groups are used in rigs all the time, but why do we need them?

SOFTWARE: AUTODESK MAYA

WHY ARE OFFSET GROUPS IMPORTANT WHEN BUILDING RIGS?

Sam Wood, Bruges

Antony Ward replies

Everybody has their own approach to rigging, but one thing I like to do when building controls is to also make sure each one has its own offset group. This is simply a group that sits above the control, so the animator never sees it or directly uses it, but it is an essential part of the rig. So what are they and why are they so useful?

When it comes to building control icons, which are often custom NURBS curves that are used to drive a joint-based rig, it's important for them to try and match the orientation of the target joint. If they don't, what will happen is when you use a constraint to lock the movement of the joint to the control, there will be an offset added to the rotation values between them. In most cases this won't be an issue, but when this is used in flexible areas that move a lot, the offset can flip at extreme angles. Usually when the rotation values reach 360, the constraint will then go to -360 instead of just continuing to increase the value.

A quick way around this would be to just match the orientation of the control to the joint, right? Well no, because if you rotate the control you then end up with rotation values on it, and ideally controls need to be clean and left at zero. What about freezing the transforms, which will zero everything out for us? This won't work either because it also resets the orientation, taking you back to square one.

This is where an offset group can be a big help. If you match the offset group's orientation to the joint instead, that will then hold all the values. The control, which is beneath it in the hierarchy, will also inherit the position and orientation, but its values will remain at zero.

Problem solved. You now have a clean control which matches the joint exactly and dramatically reduces the chances of the joints flipping.

EXPERT TIP

SPACE SWITCHING

Offset groups are also perfect for setting up space switching, i.e. moving between local space and world space. Having the main constraint on the offset group will also lock it to whichever space is specified by the user, meaning the control will move into that space yet also be free to be animated.

SOFTWARE: SUBSTANCE DESIGNER

HOW CAN I CREATE A SIMPLE CONCRETE MATERIAL USING SUBSTANCE DESIGNER?

Rita Smith, Ireland

Pietro Chiovaro replies

I will show you the easiest way to create a concrete material using Substance Designer. For this type of substance, I selected the Physically Based (Metallic/Roughness) Graph Template and deleted the Metallic output since it is not necessary for this material.

At this point, we can start to add the nodes necessary for this material, so from the Substance Designer library we need: the BnW Spots 1, Cells 3 and Fractal Sum Base noises (these three are the main elements of the texture of this concrete material), the Height to Normal World Units filter (required for the creation of the normal map), two Levels filters, the Gradient Map filter that will give colour to the substance, and the Warp filter, a key element that will help us to mix the two noise generators. At this point, we have to link all of these things together.

First of all, we need to link the Fractal Sum Base noise to the first Levels filter. Here we can decide the contrast of the concrete. Then we can link this element to the Gradient Map and consequentially we have to link this filter to the Base Color output. Then we have to mix together the Cells 1 filter and BnW Spots 1. To do this we have to use the Warp filter (BnW Spots 1 to the first input and Cells 3 to the second input). This filter can be linked to the last Levels filter, and here we have to decrease the contrast until the noise seems to be a white texture. Now we have to link this filter to the Height output and to the Height to Normal World Units filter that will be linked to the Normal output. Last but not least we have to create the link for the roughness map, to do this I decided to use the Fractal Sum Base.

Concerning the parameters that I used, I created a grey gradient with a slight yellow mix for the Base Color map. In the Height to Normal World Units filter I set these two values: Surface Size 800cm and Height Depth 30cm. Since I will use this material in Unity and Blender I selected the OpenGL format. The other parameters for the two noise generators can be adjusted as you prefer, I kept the default values.

EXPERT TIP

CONCRETE ROUGHNESS

In this material you can add a Levels filter to change the roughness of the substance. In this case I decided to keep the default values of the Fractal Sum Base noise, and I linked this noise directly to the Roughness output.

The mix between the Cells 1 filter and the BnW Spots 1 filter lets me add some cracks on the substance

The Hub

News and views from around the international CG community

MEET THE ARTIST

A look inside the studio

We chat to freelance 3D generalist **Ant Ward, aka antCGi,** about his day-to-day work life, career journey, studio setup, and his favourite projects

I count myself lucky. I've had such a long and varied career and I feel like I'm just getting started. At my core I will always be a game developer, but becoming freelance allowed me to spread my wings and experience more areas of digital art and animation. In doing so it also offered me the opportunity to write three books and a wealth of tutorials, something I continue to do today.

Come to think of it, I guess it's true when they say that you make your own luck. I'm always pushing myself to improve and learn new techniques and it's this driving force that's probably helped me to be as successful as I have been, that and a supportive family.

Do you have a background in 3D design or are you self-taught?

When I started out, 'computer graphics' weren't really a thing. All I had was an Amiga 1200 and a copy of Deluxe Paint, which was only capable of generating low-resolution pixel art and basic animations.

I did go to college to study art but again, there was no computer graphics element to speak of. This meant that once I'd landed a role in the games industry, and games began to move to 3D, I had to expand my skills and learn on the job.

When you're working in a small studio there isn't really time or room in the budget for official training, so it's just up to you to learn what you can, when you can. To be honest though, I find that the best way to learn a new tool is to set yourself a project and dive in at the deep end. That way you learn the tools you need, without getting distracted by other systems that you will never use.

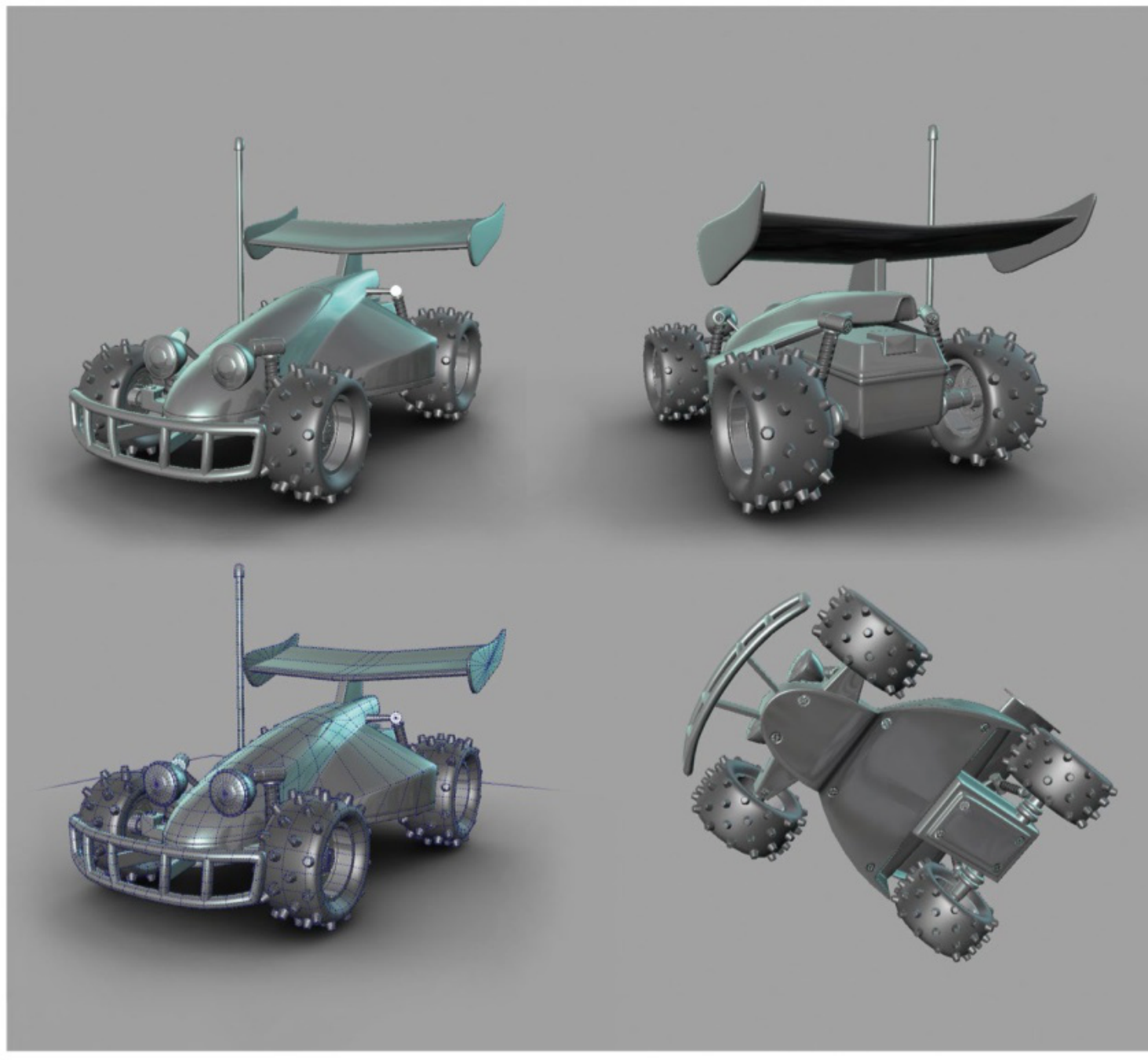
How would you describe a typical work day?

I'm fortunate enough to be able to work from my home office most of the time, so I tend to roll out of bed, have breakfast and then be working from 7:30am. I like to start early so I can reply to emails and messages and do some drawing and painting before my clients start work. I see this period as my time, so I try not to get distracted by work,

Left: This image was actually from one of my earlier **3D World** tutorials, and it still remains one of my favourite renders

Left below: My current studio setup, I do love the Cintiq Pro 24 when it comes to painting and sculpting

Below: I do a lot of real-time artwork and even some in my spare time, like this car



as it's important to have some time to get yourself organised for the day. If I'm busy, I also use this time to make a list of what I need to accomplish that day.

From about 9am my focus is then on client work right through until I finish at around 6pm, although I do try and fit in time to go to the gym. When working from home it's even more important for you to get out of the house and exercise.

I also try and fit in some time to write and record tutorials for my YouTube channel too, so every day is a busy day!

What I try not to do though is work evenings and weekends. That's family time, and it's important to have a break and maintain that work/life balance.

How long have you been creating in 3D, and what are your main software choices?

My first dabble with 3D was back in the early 1990s using an application called Real 3D on the Amiga. As you can imagine, this was very basic, and rendering took forever.

Career wise, I initially began using 3D Studio R4 in 1996 (I think), when the company I was working for then, Freestyle Software, brought it into the studio for us to experiment with. I then moved through various versions of 3D Studio but I always wanted to learn Maya. Back then it was only used on feature films, but from an outsider's perspective it looked amazing.

In 2002, while working at Gremlin Graphics, which had just been bought by Infogrames, we decided to switch the studio to Maya and I've been using it ever since.

This is my main application, but I also use ZBrush, Substance Painter, Marvelous Designer, Photoshop and many other tools now. No job is ever a one-tool job these days.

I'm also in the process of bringing Oculus Medium and Gravity Sketch into my workflow, too.

What is your typical work process?

I work on many different elements of a project – modelling, texturing, rigging and even animation – so no contract is ever the same as the last. If I'm building a game character though, I always begin my projects with some good old subdivision surface modelling. It's what I'm used to and comfortable working in, and I can get results quickly. I usually have concepts supplied by the client, so this means I can dive in and start modelling straight away.

Once I have a good base mesh, I then take it into ZBrush for detailing, that's if the model needs a high-resolution version. ›

I then create the game-friendly version of the model and UV map it in Maya, using a combination of Substance Painter and Photoshop to generate the textures.

It's then back into Maya for rigging and animation, so as you can see, I use Maya a lot.

What is your studio setup like?

I'm currently using a Wacom Cintiq Pro 24 with the Xeon Pro Engine, with a second UltraWide LG monitor above it. I use a CAD mouse and keyboard when working with Maya, but generally use the Pro Pen 3D with the Cintiq for painting, sculpting or working in Substance Painter. I also have a MobileStudio Pro which I like to use when working away from the office.

As you can see from the studio photo, I use a standing desk which I got from IKEA. It's great because it's automated, so if I need to sit for any reason, I can just lower it, but most of the time I'm standing.

I also just invested in an Oculus Rift S, so I'm now also experimenting with bringing virtual reality into my workflow.

How often do you sketch?

Once I started working with 3D I found that I stopped sketching, so a few years ago I decided that I needed to get back into it. I was getting tired of always explaining why concept art was my weakest skill.

> "I SET ASIDE AN HOUR EACH MORNING TO SIT AND DO NOTHING BUT DRAW"

So, I set aside an hour each morning to sit and do nothing but draw. I started with a sketchpad and pencil and after a few months I moved to an iPad Pro. I then transitioned to the Wacom MobileStudio Pro where I continued to work on my skills and my style.

This process has evolved as I've become more confident, so now I paint stylised portraits for fun, but I still stick to that hour a day. It's part of my routine now.

I created a video on my YouTube channel which explains my process, which has been

Far left: Just a few of the books that have helped me through the years, plus a few that I've been featured in

Left: A selection of the games I helped develop while working at Sumo Digital and Infogrames

helpful to many people wanting to start out with drawing and painting digitally.

How much time do you spend working on your personal portfolio?

Being freelance means you're always on the lookout for the next contract, and I tend to leave portfolio work for those times between projects. Fortunately, I haven't had many times when I'm not working, so my portfolio has taken a back seat lately. I'm also often restricted by NDAs so some of my best pieces of work, which I'd love to put in my portfolio, end up being locked behind these.

Any spare time I do have is taken up with recording and editing videos for my YouTube channel, which is something I chose to focus on this year. These days, when I feel the urge to be creative, I tend to paint, so these are what I upload more than anything.

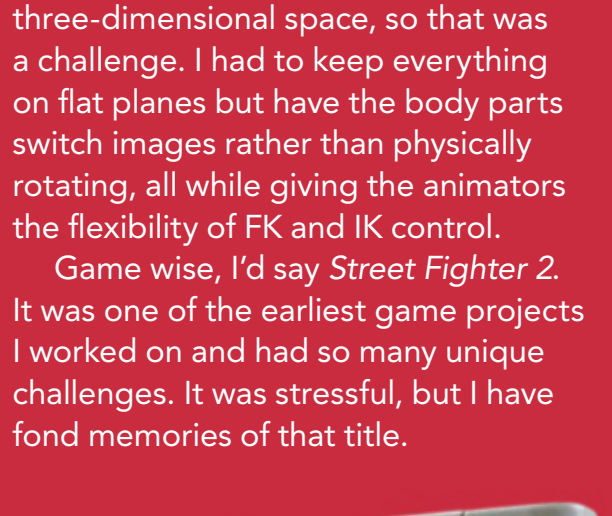
Is there a dream project you would like to work on in the future?

I'm a fan of Tim Burton's art style, so would love the opportunity to work on projects like *The Nightmare Before Christmas*. Something dark and stylised would be amazing!

FYI *Discover more of Ant Ward's work at* **www.antcgi.com**

MY FAVOURITE PROJECTS

Ant looks back at some of his most enjoyable pieces of work



I have such a varied back catalogue that no single project stands out more than the others. I guess the ones I've enjoyed the most are the ones which have been completely different to anything else I worked on, like *Abney & Teal*. For this project, which I worked on for Ragdoll Productions, I had to create a two-dimensional rig that animated in three-dimensional space, so that was a challenge. I had to keep everything on flat planes but have the body parts switch images rather than physically rotating, all while giving the animators the flexibility of FK and IK control.

Game wise, I'd say *Street Fighter 2*. It was one of the earliest game projects I worked on and had so many unique challenges. It was stressful, but I have fond memories of that title.


THERE IS ALWAYS A CERTAIN AMOUNT OF DUST IN ANY ENVIRONMENT, SO DON'T FORGET TO SIMULATE THAT

Technique focus

Incredible 3D artists take us behind their artwork

LIGHTING AND COMPOSITION

Elements like temperature, angles and shadows can all help to make the lighting in our images attractive. Look at interior shots by some of the best photographers, as this will help you achieve a fantastic sense of mood. You should also have a very clear perspective of what you are visualising. There is always a certain amount of dust in any environment which will affect the lighting, so don't forget to simulate that in your image.

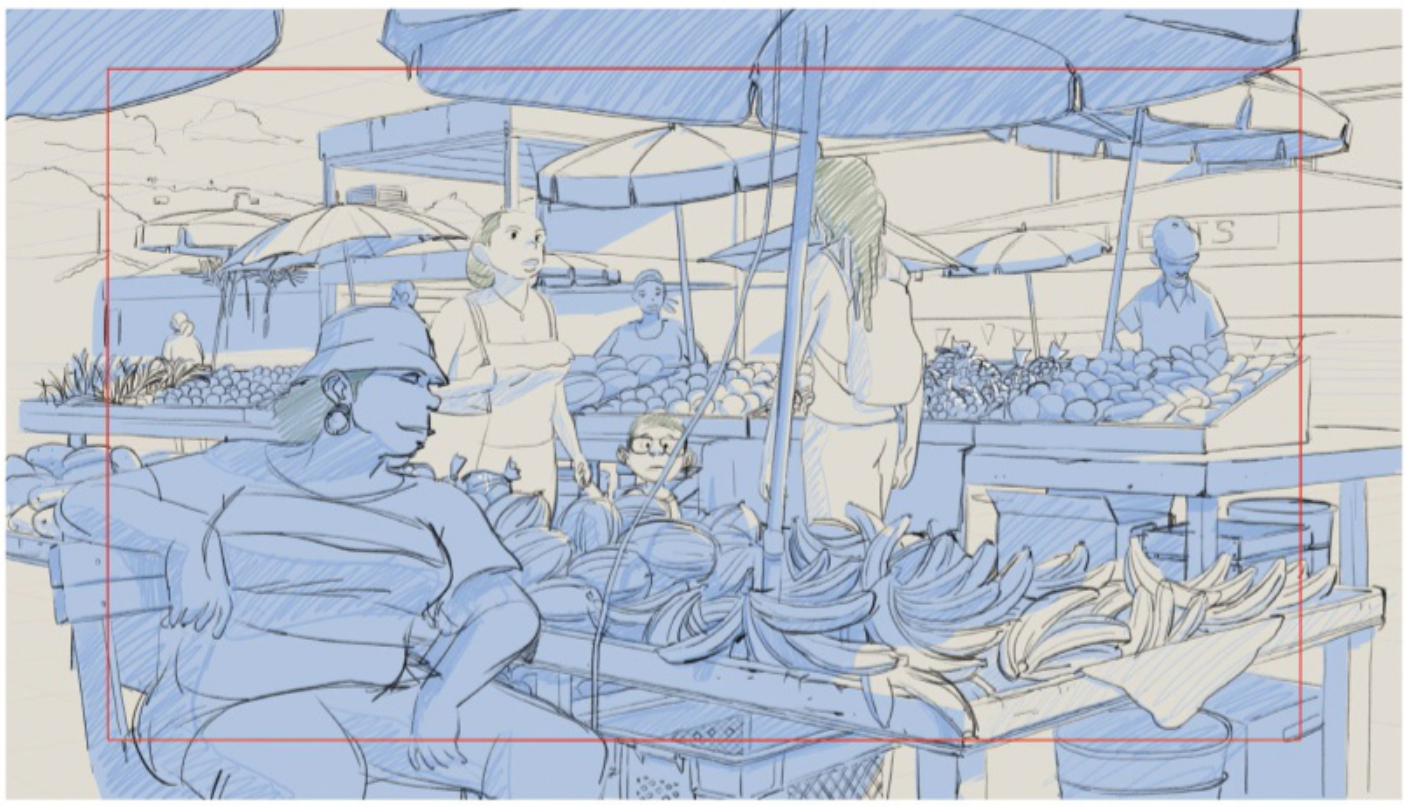
Mohsen Hashemi
renderexpert.info

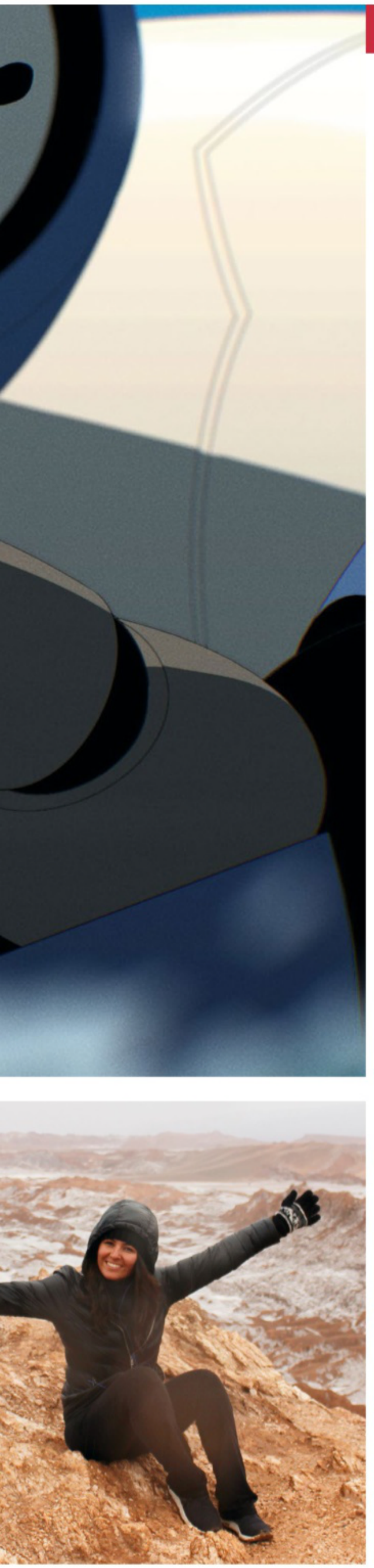
Mohsen Hashemi is a freelance architectural visualiser and illustrator, as well as a lover of art.

New York Loft 2019

Software Corona Renderer, 3ds Max, Photoshop

The Mighty Grand Piton is a short film about a young British girl, Connie, who travels to the Caribbean island of Saint Lucia for her school holidays with her family. There, she accidentally wakens Grand Piton, a giant mech buried under the Twin Piton mountains on the south of the island





INDUSTRY INSIGHT

The balancing act

Jolien Buijs spoke to four women from **Animated Women UK** about the obstacles they've faced in manoeuvring a work/life balance in an ever-challenging industry

Finding the perfect work-life balance remains an issue for many women working in the animation and visual effects industries. Negotiating the difficulties of balancing work with the demands of personal lives and the need for rest, relaxation and recharging is something many women can struggle with. Despite women working as much as men, women are often still expected to perform the brunt of emotional labour and housework at home, which means that even when they leave work they come home to more work of a different kind. Add to that the often demanding nature of working in animation and visual effects and the fact that smartphones allow us to take our work with us 24/7, and it's no wonder we sometimes find ourselves exhausted, struggling to manage it all, spending our valuable time and energy on everyone and everything but ourselves.

We spoke to four women from Animated Women UK (AWUK) who have each faced unique challenges in maintaining a healthy work-life balance, where they talk about how they have overcome these difficulties and the insights they learned along the way.

"My journey into finding a good work-life balance began when I had my daughter," explains Abi Cadogan, senior VFX editor at DNEG. "Suddenly, after my maternity leave, I felt like I was no longer part of the team. I 'wasn't pulling my weight'. Everyone else was working until 11pm, clocking up 20+ hours a week of unpaid overtime.

"The guilt was so horrific that I took on some unpaid night shifts, and I regret it to this day. My baby was beside herself because I wasn't there, and I was breastfeeding at the time so the physical pain of being away from her on top of the emotional turmoil was utterly unbearable."

Eventually, something snapped in Cadogan, "I realised that there would be no point in time when I had finished 'proving myself'. If I was willing to work late, for free, then there would always be thankless work to do. But I didn't want to work late, I wanted to go home. Actually, I wanted to leave at 4pm. Actually, when it came down to it, I didn't want to work on Fridays either."

Cadogan realised that she had to change her own thinking, rather than that of others. "I just absolutely had to stop worrying what people might think. I was doing a good job, and the work would be done when I had time to do it. If anything needed doing urgently (let's face it, everything always needs doing urgently) then I would have to be tactical; delegate, talk to my team, find a solution because, after 4pm, I just wouldn't be there. Working flexibly does not equate to putting in less effort, in fact it makes you much more efficient."

Now a mother of two, Cadogan works four days a week, 8am to 4pm. When

> "I JUST ABSOLUTELY HAD TO STOP WORRYING WHAT PEOPLE MIGHT THINK"
> **Abi Cadogan, senior VFX editor, DNEG**

ANIMATED Women UK
Supporting women in VFX and animation

Founded in 2013, AWUK exists to positively support, represent, celebrate and encourage women in the animation and VFX industries in the UK.

We aim to change the gender landscape by building a vibrant network that facilitates mentoring, knowledge exchange and education resulting in women fulfilling their potential.

Find out more at:
www.animatedwomenuk.com

"GIVE YOURSELF PERMISSION TO DO SOMETHING FOR YOU. MOST IMPORTANT: BE KIND TO YOURSELF!"

Anna Gregory, freelance broadcast TV editor and director

she first started trying to work around her hours, she found it surprisingly straightforward, "I worked out the number of hours I could sacrifice whilst still being able to pay the rent, and then I had a meeting with HR. I started working my new hours that week. DNEG is a big studio and I appreciate that I am very lucky to have an understanding boss.

"I have been working flexibly for seven years now and I feel my work-life balance is finally healthy. My attitude is more positive, I'm happy to work and I am raring to go on a Monday morning. I don't burn out any more and I'm sick less often. It was tough to face some difficult truths – that being a martyr is actually quite addictive, that it's nice to feel needed and that it was fun to be able to complain that things were out of my control. But I got over myself and made the right choice for me and my children."

Working as carer for your elderly parents is of course a huge responsibility too, as freelance broadcast TV editor and director Anna Gregory explains. "As opposed to children, elderly parents become more dependent rather than less so, which brings with it certain specific challenges."

Gregory cares for her parents three days out of a working week, and also volunteers for various organisations at a high level, including as a director on the board of Animated Women UK. "Add to that the challenge to continue managing my career, volunteering, and maintaining relationships with my partner, family and friends, and I feel like I'm constantly juggling everything. I have to wear different hats for all occasions and I have to be very organised with my time, which can be challenging and exhausting."

"When I started caring for my parents full-time, I really felt that I was no longer doing anything for myself. Juggling everything and having to be so organised with my time meant I stopped doing things for myself," she says. One key activity that has alleviated Gregory's pressure while caring for her parents full-time was to make sure she specifically carved out Sunday mornings for fitness.

"Women get so embroiled in looking after everyone else. It's important that you give yourself permission to do something for you. So my advice to other women would be to find time to do the thing that is important to you so you don't lose yourself. Most important: be kind to yourself!"

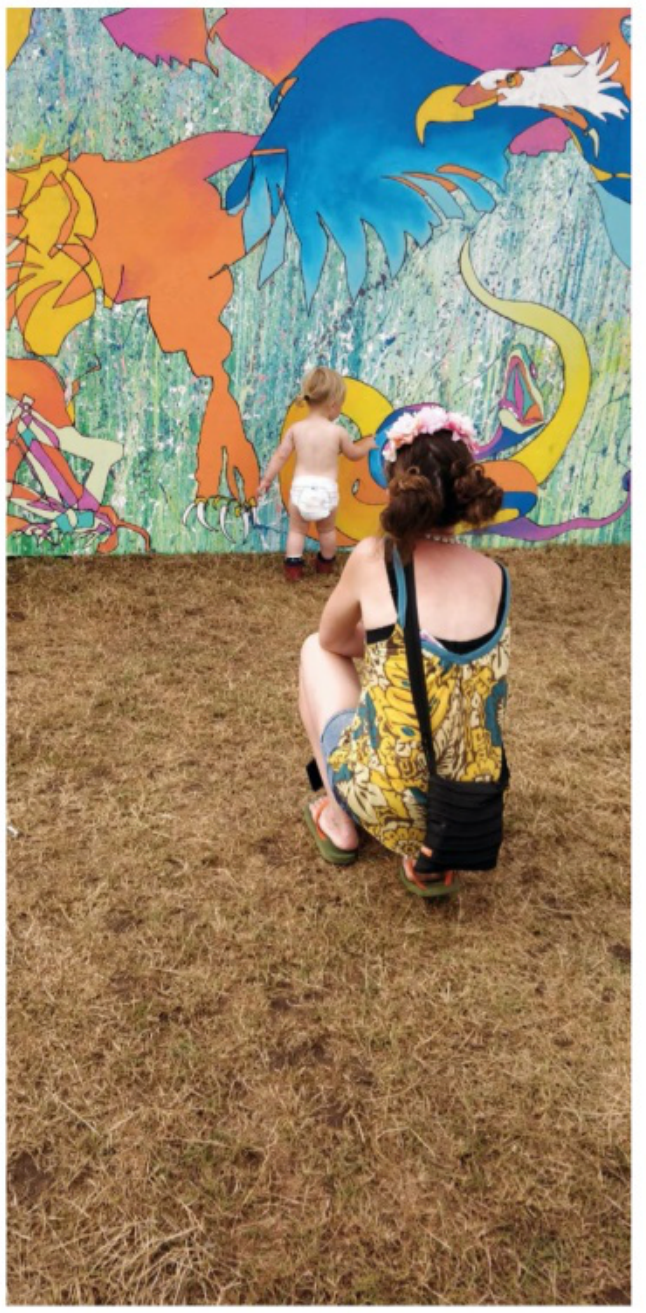
"I am mindful that at some point I will have to get back into work when my parents are no longer with me, and I am trying to make sure I can get back to work when that happens," Gregory continues. "To that end I continue to pick up pieces of work throughout the year and I continue volunteering so I can keep evolving my skills under less pressure."

Making a choice that is right for you isn't always easy and Sophie Jackson, VFX co-ordinator for Netflix, can attest to this too. "Prioritising time alone without making arrangements with other people is a struggle. As work can be fast paced and demanding a lot of the time, there is little free time in the week and that is normally spent seeing friends, family, attending work events or networking. I am someone who needs to charge my batteries (alone) every now and again, so I now make plans for myself even if that is to just do nothing sometimes. That means saying 'no' to people (which is difficult) and drawing a line with work when I feel it is encroaching too much on my personal time."

Key to this, says Jackson, is realising that not every message requires an urgent response after the core working hours. "I realised that I don't need to answer every

Abi Cadogan taking some time away from her day-to-day job to paint a mural at her daughter's school

Connie, the main character of *The Mighty Grand Piton*, a short film directed by Wesley Louis



CREATING YOUR OWN HARMONY

Senior VFX editor at DNEG Abi Cadogan, and Netflix production co-ordinator Sophie Jackson, give us advice on how we can try to balance our work and personal lives

"The industry has changed a lot since I had my daughter," explains Abi Cadogan, when we asked about any tips she could give to someone struggling to balance their working and personal lives. "People now openly value a healthy work-life balance and it's discussed a lot in the news. Unions and workers' rights have appeared on the scene. I find myself meeting more and more people who have embraced a four-day week and more people who leave early.

"Now is as good a time as any to try and reduce hours. It's not an easy choice to make, to prioritise yourself in a society that values working harder than ever, but in my opinion the rewards are insurmountable.

"I think (hope?) people will want to look back at their life and think, 'I'm glad I lived a fun and happy life', rather than 'I'm glad I worked really hard for those people'."

Meanwhile Sophie Jackson says that you could try to listen to your inner voice. "Do not be afraid to prioritise yourself once in a while. I would encourage people who are struggling to find that balance to look for things outside of work that you can enjoy so work doesn't take up all your thoughts.

"Try to make time to do things that help you relax and unwind. Whether it's through travel, finding hobbies or taking alone time to discover other things you enjoy… I have found that they are also great talking points when networking and meeting new people too (bonus!), and ultimately you will feel better about what you're doing if you don't feel exhausted and run down."

email straight away outside of office hours, and I have also been lucky enough to have a great support team at work who would be there to handle an emergency if I was unavailable. I find that if I am honest with work colleagues about the time I need to take to recharge to do the job better, then that is ultimately a good thing for all of us."

And to help her recharge, Jackson started looking for activities that were separate from both her work and friends and family. "I joined a choir and dedicated a night a week to this. I also joined a yoga class and made sure I was out the door in time for those nights of the week to do something that I enjoyed and helped me unwind.

"A few years ago I worked on a feature film and almost burnt myself out completely when it came to delivery. I was working very late nights and most weekends. I decided not to roll onto the next film and instead take a few months to travel. Something I have always wanted to do and something I was now financially able to do."

Next, Jackson met with HR, explaining that she loved her role, but the hours she had worked on the show had taken their physical toll. "I told them I had dreams of travelling and now seemed like a good opportunity to do that. They were really receptive to my feedback and were very supportive of this decision. They agreed to let me take a sabbatical and return to work when I came back in a few months' time. I travelled around South America for four months and had the time of my life! I came back with a fresh new take on things and ready to throw myself back into work.

"If the time ever came again where I was feeling too run down and unable to enjoy my day-to-day job I would absolutely do this again. It is too important to prioritise yourself and you become a better asset to the company if you are excited and fully charged to do the work."

> "I CAME BACK FROM TRAVELLING WITH A FRESH NEW TAKE ON THINGS"
> **Sophie Jackson, Netflix**

COMMUNICATING A HEALTHY WELLBEING

Freelance production manager/line producer Isobel Stenhouse discusses the changes she made to her own working life

"The first step was to admit that I was struggling and then to recognise that I had some control over my own situation," says Isobel Stenhouse. "I was fortunate to be given the opportunity to speak about working conditions and wellbeing at AWUK's Achieve Programme, and from there, I have given a talk on this topic at several studios across London.

"That has helped me feel empowered to make a stand. Now, whenever I am offered a new role or am interviewed, I raise this topic and discuss my boundaries, particularly in relation to long hours and weekend work. I feared that speaking up may have hindered my career, but instead I feel I have been heard and supported."

Stenhouse adds that people who are struggling need to discuss their challenges, whether with their management or peers. "You may discover that others feel the same way, and perhaps you can look for solutions together. It's hugely important not to feel powerless.

"Perhaps in a certain job, you really don't feel there's anything you can do to change your circumstances, but you can think about moving elsewhere, and do your research into which studios support a healthier lifestyle or have a better attitude towards their people in general. This can be daunting in an unstable industry like ours, but the benefits are worth it. This change in my own attitude has had an enormous impact on my wellbeing in and out of work."

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INDUSTRY INSIGHT

A league of their own

Find out how Cubic Motion and Riot Games brought a video game character to life using the power of augmented reality technology

Riot Games' multiplayer action-strategy game *League Of Legends* is one of the most popular and beloved games in the world, drawing a daily peak of around eight million concurrent players, even a decade after its release. The game has also spawned a fervent esports community, which holds regional leagues all over the world and pulled in some 205 million viewers for its 2018 World Championship, held in South Korea.

It was at this enormous event that Riot Games introduced the world to K/DA, a fictional K-pop group comprised of in-game champions with bold new character skins and their own song, *Pop/Stars*. In addition to an animated music video, Riot Games used augmented reality (AR) to depict the champions performing the song.

"THE AR CHARACTER REMAINED PERFECTLY IN PLACE ON THE STADIUM FLOOR AMIDST THE REAL-LIFE DANCERS"

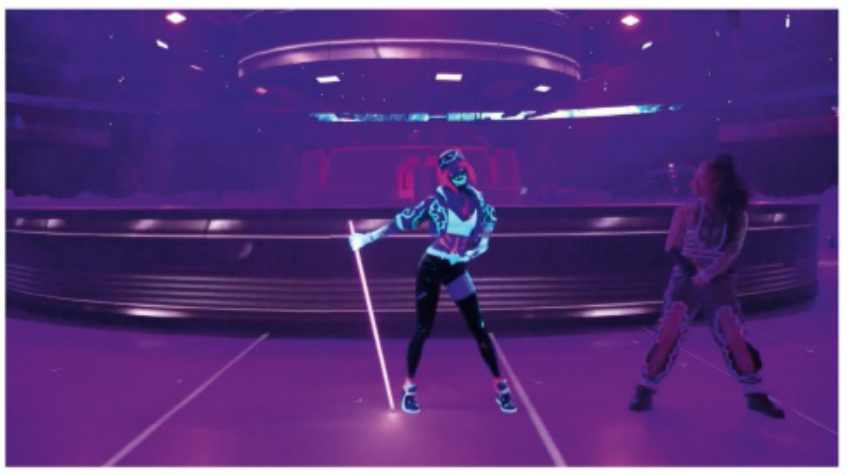
Fans fell head over heels in love with K/DA, and Riot Games decided to bring the AR experience to a whole new level. For China's *League Of Legends* Pro League finals in September 2019, Riot enlisted the talents of Cubic Motion alongside The Future Group, Animatrik and stYpe to bring K/DA heroine Akali to life during the live broadcast, both for a dance number and real-time interview.

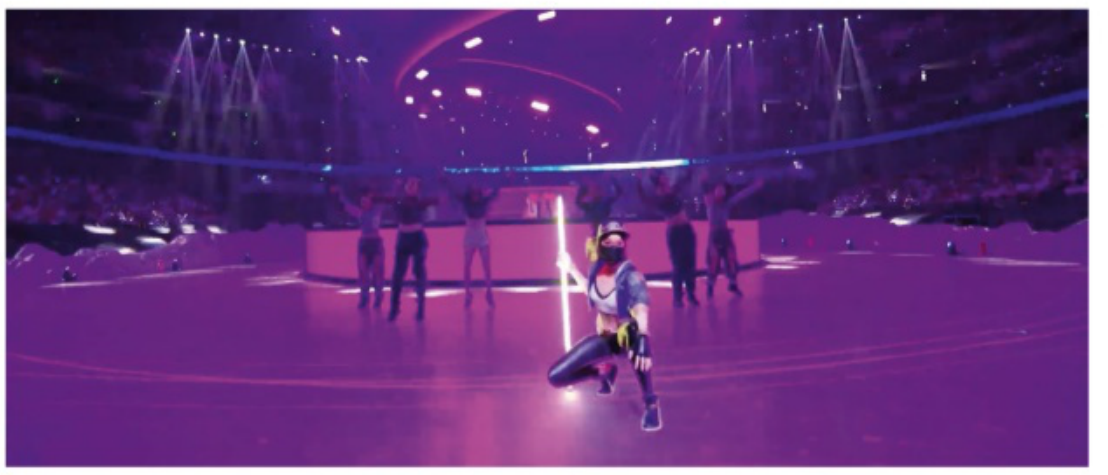
Riot Games approached Cubic Motion with a desire to do more with the K/DA augmented reality concept, including a real-time interview with a character. Cubic Motion's skilled team of computer vision scientists and facial animation experts set to work on creating a series of internal demos to demonstrate its capabilities to various stakeholders, proving that facial capture and performance could be done live. The two companies then used real-time, transatlantic

Akali is interviewed and broadcast live at the *League Of Legends* Pro League finals

Akali performs beside real-life dancers, lit up in neon colours

She crouches down in a final pose before disappearing into a puff of smoke





A TRUE COLLABORATION

Thanks to Cubic Motion's intricate facial animation technology, *League Of Legends* fans saw Akali like never before

Akali was a true collaboration between Riot Games, The Future Group, Animatrik, stYpe and Cubic Motion. The Future Group's Pixotope virtual production system was used on the project, while mocap specialists Animatrik handled body capture work, and stYpe provided the live camera tracking hardware. Cubic Motion's facial animation expertise was its most significant contribution, but the team also worked on the dance number and did clean-up of the body work.

With help from Nvidia's RTX series graphics cards, Akali was realised with stunning real-time facial animation and ray-tracing, breaking new barriers for augmented reality as the digital human took the stage at Shanghai's Mercedes-Benz Arena. It was all done with an eye towards creating the most seamless, lifelike character they could, and to enhance the viewing experience of the die-hard *League Of Legends* audience.

video conferencing to creatively work together and pin down the overall look.

Cubic Motion took a big step forward with its rigging capabilities for this project, taking the existing Akali character model and rebuilding the facial rig from the inside out. Along with look development, rigging proved to be the most difficult challenge involved in realising Akali as a believable character entering the real world, that could be driven live by a real performer backstage.

The AR character danced and twirled a glowing sabre, remaining perfectly in place on the stadium floor amidst the real-life dancers, before disappearing into a puff of smoke at the end. Afterwards, Akali delivered a fluid and natural conversation with an interviewer, as if the real champion was there to greet thousands of excited fans.

As with the original World Championship performance, the reaction from fans was wildly positive. Riot Games introduced a new vision of what's possible with AR characters at world-class events; the technology is accessible and available for all kinds of real-time activations. Fans from Europe and North America have now also expressed their desire to see Akali and her K-pop comrades take the stage in their native regions.

Excitement around digital humans is growing exponentially as the results become all the more natural and believable, and the ability to pull a beloved character out of its video game universe and into the real world holds incredible potential.

PRO THOUGHTS

Mobile phone VR is dying out. Good.

Why the shift in direction by mobile manufacturers benefits both VR and AR

In October 2019, Google announced that they would be discontinuing their Google Daydream VR headset. Coupled with Samsung declaring their latest phones will not be compatible with their Gear VR headset, it's safe to say that mobile phone VR – if not completely dead – is on its way out. Quite right too, says Lorna Burrows, Head of Content at Immersive Studios. It's time VR is given the space it needs to be done right.

A HELP AND A HINDRANCE

In the early days of VR, when Google Cardboards were making everyone queasy and the Oculus DK2 had a month's-long lead time, the onset of proper mobile phone VR was a revelation. And it was great – VR was easily accessible, and it offered pretty much the only practical alternative to tethered headsets that relied on pricey PCs. Samsung were even giving away headsets with their S6 and S7 handsets for a while!

But it was also problematic. The quality of the experience would sometimes cause motion sickness, effectively traumatising a significant percentage of VR's potential audience – and the phones themselves would often overheat and stop working, let alone losing most of their battery in a short space of time. Naturally over time mobile phone headsets improved, but so did all VR tech. And by that time, the damage had already been done. There was a perception that mobile phone VR was the only cost-effective, and therefore realistic, option for consumers – and it just wasn't good enough.

THE GAME CHANGERS

The change came from companies like Oculus and HTC who invested, researched and developed heavily in standalone headsets that gave a PC-like quality experience without the need for a mobile phone – and at a price point that would compete with a mobile phone handset/headset combination. Since the Oculus Go hit the market over two years ago, the standard for standalone VR headsets has just got better and better. Today, the Oculus Quest is considered to be one of the best headsets you can get – offering high-end graphics, an easy-to-use interface, quality hardware, long battery life and genuinely fun experiences that are unlikely to have you reaching for the sick bucket.

This is what VR should be. And without the mobile phone option muddying the waters, it allows good-quality, highly effective VR technology to take centre stage. What's more, the Quest alone will only put you back £400 all in, compared to at least £700 for a Google Pixel or £800 for the latest Samsung smartphone – let alone the cost of the headset on top of that. Plus, it's easier and cheaper to develop for, so it suits content creators too.

THE BEST SIDE EFFECT

When Google announced they were discontinuing the Daydream, they also reiterated their focus on AR, saying: "We're investing heavily in helpful AR experiences like Google Lens, AR walking navigation in Maps, and AR in Search that use the smartphone camera to bridge the digital and physical worlds." And this, in a nutshell, is another benefit of mobile manufacturers moving away from VR. The majority of AR experiences are accessed through smartphones or tablets, so it makes complete sense, with the current surge in the AR market, that the big mobile players are focusing on that instead. The good news is that the rivalry between Android and Apple will likely lead to rapid development in the capabilities of AR as the two behemoths slug it out in the AR arena.

Meanwhile, Oculus and HTC, plus a number of other less well-known brands such as Pico Interactive, are well and truly owning the standalone VR market – which is how it should be. Mobile phone manufacturers should focus on doing what they do best: creating smartphones with a whole range of different uses, and leave VR to those who specialise solely in this type of tech – who can give this very exciting technology the space it needs to thrive.

FYI *Find out more at* **weareimmersive.co.uk**

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Cinematographer Matt Workman demos the LED wall stage

INDUSTRY INSIGHT

The next big thing in VFX: no VFX at all

LED walls and real-time rendering techniques are enabling in-camera visual effects to transport actors to almost anywhere you can imagine

In the era before bluescreen and greenscreen photography, actors were often transplanted into exotic locations courtesy of rear screen projection. The setup for this was relatively simple: the actor stood in front of a screen, and behind it was a projector projecting previously filmed images that the actor would pretend to be part of.

It was an effects methodology that often worked well because it existed in a controlled environment where sound, lighting and timing could be managed. Front projection also became another incarnation. The projection techniques meant that a final 'in-camera' VFX shot could be captured with no further effects work required.

Generally, rear and front projection fell out of favour once chromakey techniques (i.e. bluescreen and greenscreen extraction and compositing) were mastered. But in recent years, the techniques have come back into the fore, for example in the films *First Man* and *Solo: A Star Wars Story*. That's due to a few reasons: the quality of projectors and screens – including, now, LED screens – have vastly improved, and such projections have become very useful for adding relevant interactive lighting and to give actors something to look at while working a scene.

It means final in-camera rear projection and front projection shots have been edging closer to reality once again, sometimes utilising pre-shot live-action footage and sometimes pre-rendered or pre-composited scenes for the projections themselves.

An evolution in technology

In-camera VFX shots have many advantages. Once you film the shot, it's 'in the can', and there is no post-production effects work required (of course, for the imagery on the screen, the work might have to be done up front).

But just as rear projection has been making a comeback, so too has a new wave of technologies aimed at providing an even greater scope of in-camera visual effects shots; a combination of LED walls, real-time rendering and virtual set production, photoreal real-time environments, on-set tracking and VR set scouting.

Real-time rendering has certainly already made a big impact in filmmaking, in particular in the realm of 'virtual production'. Real time aids in making things like previs, techvis, postvis, motion capture, VR, AR, simul-cams and virtual cameras possible. Now there's another way that real time is having even more impact on set, in combination with LED

The photoreal CG environment on the walls was realised mostly using photogrammetry by Quixel

walls to provide an 'almost' rear projection experience, but even better.

Recently, Epic Games – the makers of Unreal Engine – set up a specialised stage in Los Angeles to showcase how the latest in LED wall technology and real-time rendering could help achieve in-camera VFX shots. If you walked onto this stage, it might, at first, appear to be any normal film shoot. An actor on a motorbike was positioned in the centre of the stage on a sand and dirt covered area. Surrounding him were three walls of LED screens, and projected onto those walls was a rocky outcrop setting. The floor on which the actor and bike stood matched perfectly to the imagery on the screens. So unless you got up really close, you couldn't decipher a seam between them.

Meanwhile, a camera on a crane was also part of this setup, and if positioned in the right way, it could shoot footage of the bike and rider to make it look like they were, in fact, located amongst the rocky outcrop, as if a camera crew had gone out and shot all this at some desert location.

What's more, the footage could serve as a finished shot i.e. no additional compositing needed to be involved. And, the rocky outcrop could be changed to almost anything, because it was 100% CG and rendered in real time. When the camera moved, so too did the rendered background, in real time, to help sell the parallax movement in the frame. Light from the imagery on the LED panels also ultimately lit the bike and rider realistically, so that the right kind of glints and reflections could be captured right there at the stage.

A real-time collaboration

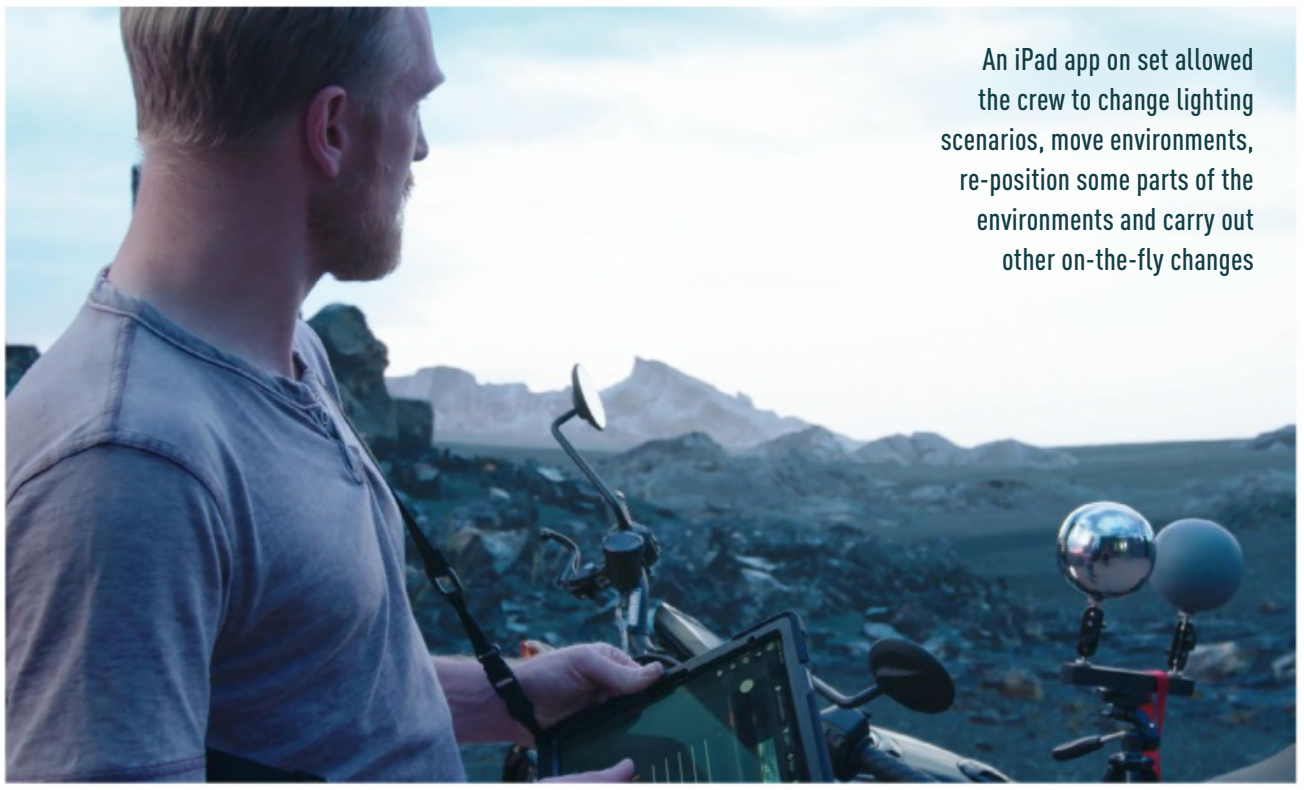
Epic Games was the main demonstrator of this LED wall technology, but it took several pieces of tech to make it happen, as Epic technical product manager Ryan Mayeda told **3D World**.

"The tools and techniques that were brought together to make this virtual production demo possible include LED panels and processors spec'ed out by Lux Machina, optical motion capture camera tracking, the ARRI Alexa LF camera, Unreal Engine 4.23, HTC Vive Pro headsets, and NVIDIA Quadro RTX 6000 graphics cards with Quadro Sync II cards. The companies involved were Lux Machina (stage buildout, LED walls and system integration), Profile Studios (camera tracking), Magnopus (VR location scouting technology), Quixel (photoreal CG environments), and ARRI provided the camera."

With that selection of technology, several things could be done on the LED wall stage – in real time – to aid in acquiring a scene. ›

Above: A virtual sunset is projected onto the LED walls and instantly changes the mood of the scene

Right: Three different lighting scenarios projected onto the LED walls, which changes with the on-set lighting



An iPad app on set allowed the crew to change lighting scenarios, move environments, re-position some parts of the environments and carry out other on-the-fly changes

The lighting on the actor and from the walls could be modified immediately, thanks to an iPad app. The 3D scene itself could be changed if necessary, with geometry literally moved around. The actor could see the action they were acting against and not have to imagine what it might look like later. Another benefit was being able to build, review, scout and tinker with the virtual environment beforehand, including in VR, in order to produce the most compelling imagery possible.

To film a scene, Mayeda says that the real-time rendered imagery needed to look photorealistic and run at 24fps. The CG team would try to avoid the use of baked lighting to enable the creative team on set maximum flexibility in making visual adjustments for a given shot. For anyone looking to employ this kind of filmmaking, Mayeda recommends "using extremely high-fidelity digital environment maps like those available from companies like Quixel. Photogrammetry can also work well for recreating real-world locations."

That near-perfect seam between set and the CG environment on the LED screen is made possible thanks to colour-correction in Unreal Engine 4. "This is typically done once per environment when a new scene is brought up for the first time," explains Mayeda. "The Unreal Engine operator can first make a broad colour correction to the overall area where the CG environment meets the set to get it as close as possible. Then, more localised changes with 'colour correction volumes' can be made that apply tweaks within a simple piece of geometry that can be positioned to affect specific areas and ensure a perfect blend."

Changing the game

The ultimate idea of these LED walls is to produce a live 'final' composite, as well as reduce the need for any post-production. This means, however, doing more of the heavy lifting upfront in pre-production (something visual effects teams don't often get to do). Mayeda believes it can change the way films are made.

"The goal of virtual production in its many forms is to restore more creative control to the director of photography (DP) and director, and increase collaboration on set," he says. "DPs and crews have access to much more flexible and realistic lighting for VFX, and are no longer beholden to what time magic hour is or how long it lasts. With the initial introduction of digital filmmaking and visual effects, technology moved many creative processes off of the set and silo'ed them in the post-production realm. This new real-time approach to filmmaking helps restore that responsibility to the filmmakers and opens the door for creative discovery and happy accidents when the DP and director can iterate on new looks in real time."

> "WE'RE NO LONGER BEHOLDEN TO WHAT TIME MAGIC HOUR IS OR HOW LONG IT LASTS"
>
> **Ryan Mayeda, technical product manager, Epic Games**

THE ENGINE BEHIND THE WALL

A look at the features in Unreal Engine that help make this new LED wall filmmaking possible

This LED wall demo showcased in Los Angeles was made possible by several recently released Unreal Engine features, many of which are new in Unreal Engine 4.23. They include:

1 nDisplay – for multi-machine LED wall rendering with camera frustum. nDisplay allows multiple instances of a real-time project to be displayed over multiple screens.

2 LiveLink – for camera tracking. LiveLink provides a common interface in Unreal Engine for streaming and consuming animation data from external sources.

3 Multi-user Editor – for live collaboration. This allows for a shared real-time session in which multiple people can contribute to a single project.

4 VR Editor with Virtual Production Utilities plugin for VR scouting – here, users can don a VR headset to scout the set for the best angles or to work out any changes required.

5 Remote Control Rest API for stage iPad app – provides for a new UI to be able to interact with the Unreal Engine project.

6 Composure for live compositing – the LED wall can display a pure green or bluescreen that then enables live compositing of the actor into a new background.

All images courtesy of Epic Games

CASE STUDY

William Vaughan: Kick Starter

The multi-talented head of New Balance's 3D team says that GPU rendering with Modo's mPath engine and AMD's Radeon ProRender will transform artists' work

William Vaughan is a hard artist to categorise. Currently Senior 3D Production Manager at multinational shoe firm New Balance, he is also a prolific creator of 3D characters, whose work has appeared in Hollywood movies, architectural visualisations, and even as vinyl toys. An author and educator – he was also previously academic director of The Digital Animation & Visual Effects School in Florida – his published output ranges from the likes of guides to 3D modelling to science-fiction novels.

For the past decade, the thread uniting this varied career has been Modo: Foundry's creative 3D modelling software, and Vaughan's primary production tool. And what currently excites him about the application is the way that the current Modo 13 Series of releases are able to harness the power of modern GPUs, both through Radeon™ ProRender, AMD's powerful physically based render engine, and mPath, Foundry's ground-up redesign of the native Modo renderer.

Modo for character modelling

Vaughan first used Modo on *Partly Cloudy*, Pixar's 2009 animated short, on which he worked as a freelance character modeller. "At the time, what blew me away was how interactive everything was," he says. "I wasn't keying in numbers and seeing what happened: I was interacting with my model in real time. That and Modo's selection tools were the biggest selling points to me."

Over time, Modo would gradually replace other 3D software in Vaughan's workflow, both on his personal and professional projects. "It's a complete package: all of the tools are there, they're easy to use, and they're flexible," he explains. "Although I model 3D characters, I think of myself more as a problem-solver – and Modo has everything I need to solve my problems."

Modo for product design

Vaughan has also been instrumental in implementing Modo in the design pipeline at New Balance. In place of its old workflow of creating designs in 2D, having them manufactured physically, then modifying the 2D designs accordingly, the company now uses Modo to create 3D prototypes.

"One of the big driving forces for introducing 3D was to cut down on physical samples," says Vaughan. "By doing that, we're cutting costs, but also reducing the impact on the environment."

Having now trained over 50 New Balance designers to use Modo, Vaughan praises the software's shallow learning curve. "It's very artist-friendly," he comments. "Most of New Balance's designers didn't have a background in 3D, but in Modo, you can get to a nice-looking render very quickly."

Modern GPUs for rendering

Of all of the changes in this year's Modo 13 Series of updates, Vaughan is most excited about the way that the software is taking advantage of the processing power of modern graphics cards: a process that began in Modo 13.0 with the integration of Radeon ProRender. AMD's physically accurate GPU renderer provides artists with fast, interactive, photorealistic previews of their 3D models.

William Vaughan

Main: All of New Balance's shoes, like the FuelCore Agility v2, are prototyped in 3D inside Modo

Left: New Balance hired William Vaughan to help implement Modo in its shoe design pipeline

Above: Characters created by William Vaughan for architectural visualisation firm Muharraqi Studios

"IN SOME CASES, A SCENE THAT WOULD NORMALLY TAKE **24 MINUTES** TO RENDER WAS DONE IN **NINE**. IT'S JUST INSANE"

William Vaughan, Sr. 3D Production Manager, New Balance

"Modo is known as a great modeller. People know that it produces good renders. But they have been waiting to take advantage of the GPU [to speed up rendering]," he says. "Radeon ProRender was the first taste of that in a Modo pipeline."

More recently, Vaughan has been testing mPath, the new path tracer introduced in Modo 13.2. mPath reinvents Modo's native render engine as a modern, hardware-agnostic renderer, able equally to take advantage of the processing power of massively multi-core CPUs like AMD's Ryzen™ Threadripper™ chips, and of professional GPUs.

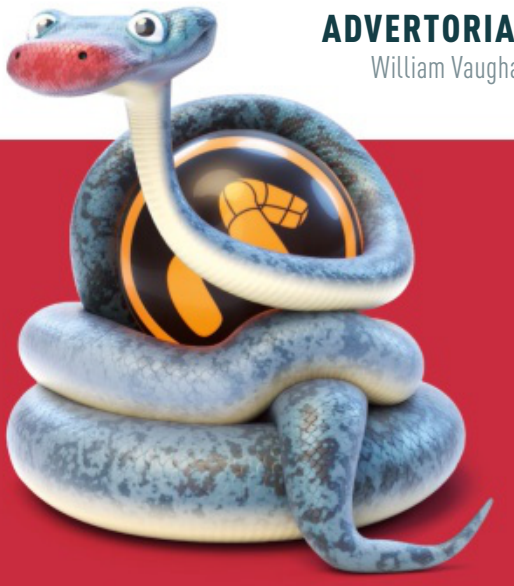
In Vaughan's tests, existing New Balance production scenes rendered in mPath in Modo 13.2 in a fraction of the time they used to with the old standard renderer in Modo 13.1. "In some cases, a scene that would normally take 24 minutes to render was done in nine," he says. "It's just insane."

A game-changer for Modo users

Whether for interactive previews with AMD's Radeon ProRender, or final-quality output with mPath, Vaughan describes the fact that Modo can now take advantage of the GPU to speed up rendering as "one of the biggest pieces of news that Foundry could have for the software."

"I see myself primarily as a modeller, so the fact that it's the thing I'm most excited about speaks volumes to the importance of GPU rendering," Vaughan says. "Modo is already a complete toolset for 3D artists – but if you can make our workflow faster, we'll be very happy."

FYI *See more of William Vaughan's work at* **artstation.com/williamvaughan**



WHAT'S NEW IN MODO 13.2?

Modelling, rigging and animation changes streamline common tasks

As well as the new mPath render engine, Modo 13.2, the latest release in Foundry's Modo 13 Series, brings with it further updates to the powerful direct modelling tools that New Balance uses in production every day. The new Edge Chamfer tool creates rounded edges on geometry – essential in hard-surface modelling workflows like product design – generating better geometry and cleaner UVs than the existing Edge Bevel tool, which it is ultimately intended to replace.

In addition, the update extends Modo's rigging and animation tools, both for technical visualisations and for the characters that William Vaughan creates in his personal work. Vaughan is particularly impressed with the new Planar IK system, which makes it easier to create soft or stretchy IK setups when rigging limbs. "I'm having to do less work to get nice soft transitions from when a limb is bent to when it is fully extended," he says. "That affects something as simple as a walk cycle."

Modo 13.2 also adds a new system of Gradient Layers and Gradient Modifiers, reducing the number of deformers required to create complex character rigs, and streamlines workflow in the Graph Editor, with options to fit the Timeline range to the animation curve selected, and to normalise the vertical ranges of a set of curves.

Finally, Radeon™ ProRender, AMD's GPU render engine, has been updated to match Modo's Principled Shader and physical material more closely, further integrating ProRender into standard workflows, with the latest release adding support for the physical material's Specular and Dissolve properties, plus the Film Offset controls of the Modo camera.

Reviews

We explore the latest software and hardware tools to see if they are worth your time or money

HARDWARE GROUP TEST

NVIDIA RTX STUDIO LAPTOPS

Nvidia's new laptop branding guarantees excellent 3D performance, so we took three individual models out for a spin

Although PC hardware isn't particularly complicated, it's easy to overlook how the mountain of acronyms, code words and limitless combinations of different products could be seriously daunting for designers who aren't technical experts. Prospective buyers have to dedicate time into researching whether or not a computer that catches their eye is any good with the software they use, and as we all know not every laptop is great at 3D.

Until now, the design industry has lacked a single simple branding, intended to let buyers know that a laptop has a specification that guarantees great performance in creative software. That's why Nvidia has stepped in with RTX Studio, a labelling and set of base specifications that guarantees great performance and an all-round experience when it comes to animation, graphic design, video and photo editing software.

Nvidia has set the performance bar quite high. An RTX Studio laptop has to have a minimum of an Intel Core i7, 16GB of system memory, and a 512GB SSD. Minimum graphics requirements are a GeForce RTX 2060, Quadro RTX 3000 or higher, or a Titan RTX. It covers the display resolution as well, which can be no less than 1080p or 4K.

This list of graphics cards is only from Nvidia's latest Turing generation, which adds a few specialised features that assist with hardware-accelerated ray tracing and machine learning. With the RTX Studio branding, buyers can also be certain they're getting a laptop that supports these Nvidia-exclusive hardware features.

Colour-accurate screens are a huge benefit for digital content creation

There's no need for a desktop workstation when laptops pack in this much performance

Thin and light laptops are now powerful enough for serious rendering, but expect to pay for the privilege

"TRULY THIN AND LIGHT LAPTOPS WITH ENOUGH GRUNT FOR SERIOUS 3D RENDERING"

The graphics cards are all Max-Q variants too. Unlike a few years back, when Nvidia had two distinct hardware designs for desktop and laptop graphics cards, Max-Q cards are basically the same as their desktop counterparts, but running slower to fit into a much narrower power envelope than is available on a desktop rig.

In conjunction with recent advances in laptop cooling systems, this has ushered in a wave of truly thin and light laptops that actually have enough grunt for serious 3D gaming and rendering.

Seven manufacturers are on board with Nvidia RTX Studio right now and the market is split with a mixture of 15 and 17-inch models, powered by either GeForce or Quadro cards. We've got three Nvidia RTX Studio laptops in our labs this month, and we put them through their paces with benchmark tests as well as spending some time using each of them with design software to get a feel for how they generally perform.

However, while the RTX Studio specification does allow for mid-range configurations, manufacturers are generally taking aim at the high end with the systems they offer. Expect to dig deep into your wallet, and even deeper for the most powerful Quadro RTX 5000 or RTX 6000 systems. With that caveat in mind, let's take a look.

Acer ConceptD 7

PRICE £2,799 | **DEVELOPER** Acer | **WEBSITE** acer.com

Below: The Acer ConceptD 7 is the best-value RTX 2080 laptop on test, with an impressive specification

Right: Downgrading the graphics makes RTX Studio laptops more affordable, but you still get a great display and processor

Acer's Concept series of laptops and desktops is the firm's pitch at products aimed at designers and creative work, adopting RTX Studio for the oddly named ConceptD 7. It's a 15.6-inch laptop with a 4K screen that has lovely thin bezels around the side. Inside it's fitted with an Intel Core i7-9750H, GeForce RTX 2080 Max-Q with 32GB of memory and a 1TB PCIe SSD.

It's a great laptop specification indeed and actually identical to that of the other two RTX Studio laptops on test. Breaking it down, the Intel Core i7-9750H is a six-core processor, running at 2.6GHz with a 4.5GHz Turbo Frequency.

The RTX 2080 Max-Q in the ConceptD has 8GB of GDDR6 VRAM and a 735 MHz clock speed, a big step down from the 1,515 MHz clock of a desktop RTX 2080, even though it still has the same 2,944 shaders, 46 ray tracing cores and 368 Tensor Cores.

It's also well equipped with ports. Unlike a certain fruity company, Acer has sensibly stuck with three traditional USB-A ports, squeezed in a proper Ethernet port, and still offers Thunderbolt connectivity over its USB-C port. HDMI and DisplayPort outputs give you display output options too.

The looks might divide opinion though. While the ConceptD 7 is encased in a solid metal chassis, which feels good to use with a comfortably sized trackpad and keyboard, we found it a tad on the ugly side. Acer has contrasted the white chassis with a bright yellow/orange backlit keyboard, but aside from the two angled corners there are few other interesting design features of note.

More noticeable is the large space directly under the display which makes the screen look as if it's been squashed upwards. Even though other laptops have the same area under their display, it looks worse on the ConceptD 7 because of the white casing.

Acer's ConceptD range also includes a (black) ConceptD 9 Pro, a higher spec 17-inch RTX Studio laptop that swaps the GeForce for a Quadro RTX 5000, the Core i7 for a Core i9 and raises the maximum SSD storage to 2TB.

And at the other end of the scale there's a ConceptD 7 with an RTX 2060, smaller 512GB SSD and just 16GB of memory for £2,299.

As with all the RTX studio laptops on test, the ConceptD 7 has a colour-accurate screen that looks a lot better than most desktop displays, presenting 100% AdobeRGB colour coverage that simply looks fantastic. A colour-accurate display is an oft-overlooked component of a design rig, so its inclusion on the ConceptD is definitely a worthy addition.

While the ConceptD 7 is still a pricey investment, it's also the best value of the three RTX 2080 laptops on test, retaining high performance without stepping over the £3,000 line.

VERDICT

FEATURES

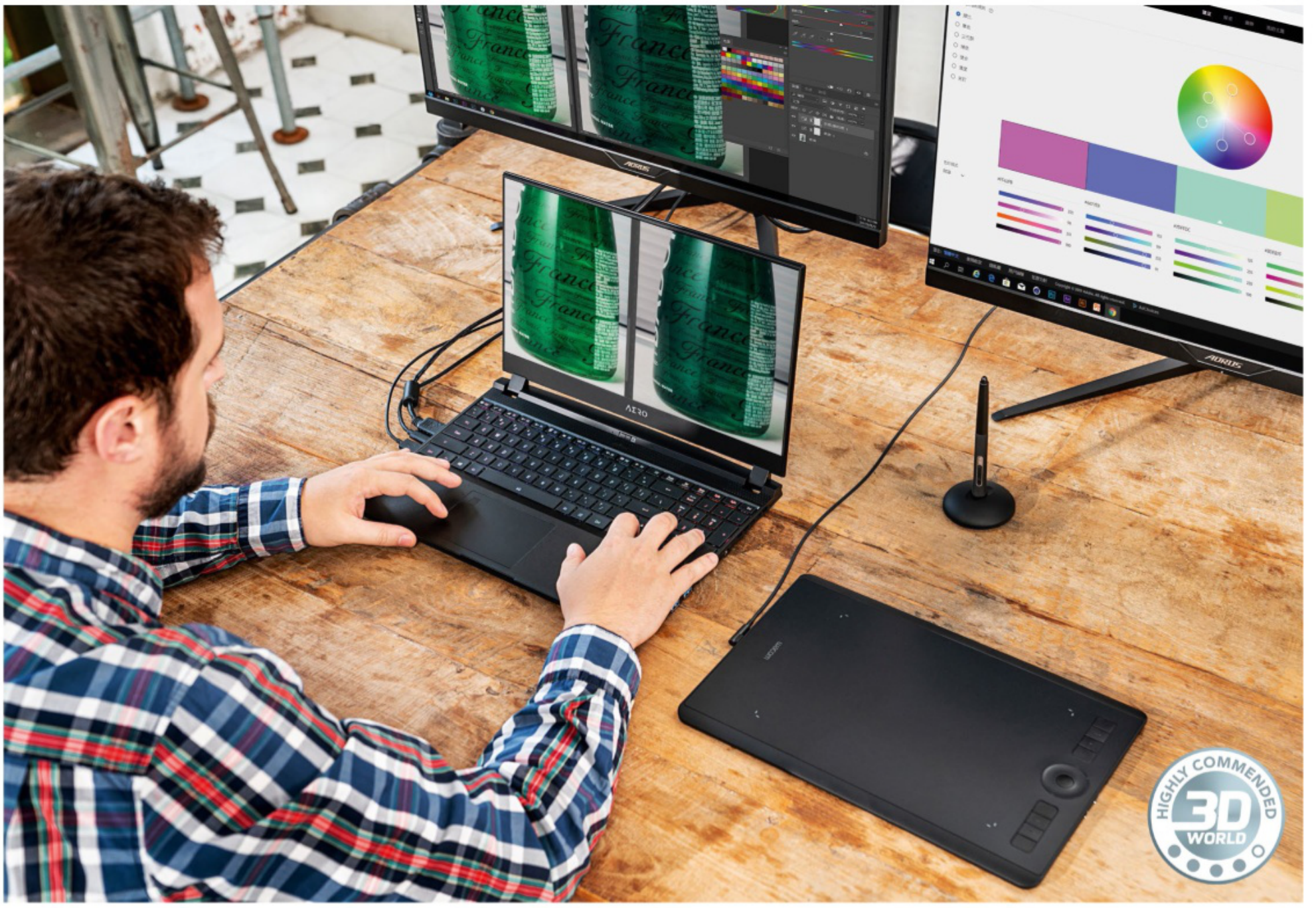
15-inch 4K colour-accurate display

Intel Core i7-9750H (six cores)

Nvidia GeForce RTX 2080 Max-Q

32GB RAM

1TB SSD



Gigabyte Aero 15X

PRICE £3,099 | **DEVELOPER** Gigabyte | **WEBSITE** www.gigabyte.com

The Aero 15X is another RTX Studio laptop featuring the tried-and-tested combination of the six-core Intel Core i7-9750H and GeForce RTX 2080 graphics card. As with the other laptops on test, it's a nicely thin and light design, with 32GB of memory in our review model and a 1TB PCIE 3.0 SSD.

This internal specification (broken down in detail in the previous review) is more than capable of both high-end 3D design tasks as well as games, which could explain why we've seen it in multiple laptops.

The stand-out feature of the 2019 version of this laptop is the advanced 4K HDR AMOLED display. OLED display technology presents extremely bright and colourful images, and is generally touted as being more advanced than the LCD screens in typical IPS panels, capable of deeper blacks and better overall image quality. Similar technology is employed in the Razer Blade Advanced Model.

That said, while the OLED displays in both the Aero 15X and Razer Blade present a very sharp picture with superb image quality, the colour-accurate displays hardly look bad in laptops that use traditional IPS technology, so we're not so sure the OLED advantage is quite the deal breaker you might imagine.

Thankfully, as with the Acer ConceptD, Gigabyte has retained a physical Ethernet port, joining the three USB-A and USB-C ports. We're pleased to see an SD card reader as well, which is not something you get these days on every laptop.

One area we weren't keen on was the design. The garish and bright default cycling RGB pattern over the keyboard backlight might be delightful for teenage boys who are looking for a loud and brash gaming laptop, but it's not great for getting work done, as we found it both ugly and harder to type on. As one of the most noticeable visual features of the Aero 15X, it can thankfully be disabled with the Gigabyte Fusion software.

Similarly, the overall design feels like a step down from the metal exteriors of other laptops. We prefer the all-metal unibody of the Razer Blade and the more roomy trackpad. We also found the Aero 15X was the noisiest laptop on test. While the Razer was silent, the Gigabyte emitted a very low hum when running 3D tests, despite the 71-blade dual fans inside it.

FEATURES

15-inch OLED 4K 100% DCI-P3 colour-accurate display

Intel Core i7-9750H (six cores)

Nvidia GeForce RTX 2080 Max-Q

32GB RAM

1TB SSD

VERDICT

FEATURES

15-inch 4K OLED touch-sensitive 100% DCI-P3 colour-accurate display

Intel Core i7-9750H (six cores)

Nvidia GeForce RTX 2080 Max-Q

16GB RAM

512GB SSD

HIGHLY COMMENDED 3D WORLD

The minimalistic aluminium Razer Blade 15 design is a winner

Razer Blade 15 Advanced Model

PRICE £3,149 | **DEVELOPER** Razer | **WEBSITE** razer.com

Since its earliest beginnings, Razer has consistently focused on products with high-end features and performance, perhaps slanted more towards gaming than creative work, but that has changed more recently with its Razer Blade Advanced Model.

"YOU PAY SLIGHTLY MORE FOR THE RAZER BRAND, BUT THAT ALSO MEANS BETTER MATERIALS, AND QUIETER OPERATION"

With a solid black unibody aluminium case, the latest Razer Blade feels solid, even though it's still thin. Both the keyboard and touchpad are noticeably roomy and aside from two speakers to the sides of the keyboard, it's also a stark, highly minimalist design, which we consider superior to the gaming-oriented flashy LED design employed by other manufacturers.

Ports and connectivity are fairly generous too, with three USB-A ports, a USB-C/Thunderbolt 3 port, DisplayPort and HDMI, but no built-in Ethernet port though, so you'll need a dongle for that. Support for the new WiFi 6 standard is a bonus.

However in the test model we received, SSD storage was limited to 512GB and memory to 16GB, which seems disappointedly stingy on a laptop that retails for over £3,000. It appears that if you want that, you'll need to invest in a different Razer laptop.

On Razer's website, there seems to be quite a confusing range of configurations. Even though it's more expensive, the newly announced silver Razer Blade Studio edition is probably better all-round value, as it not only nets you a Quadro RTX 5000 rather than the GeForce, you also get more memory and a larger SSD.

Razer also sells Blade 15 laptops that have less powerful graphics cards, and some that omit the OLED colour-accurate display and instead offer either a 120Hz or 240Hz refresh rate. This is a fantastic feature for gaming, but for designers the colour-accurate option is arguably more useful. Also we noticed WiFi 6 is only available on the more high-end models.

An extra investment you can opt for is Razer's official Thunderbolt external graphics card array. While we didn't get a chance to test this, it lets you connect a second desktop graphics card over Thunderbolt for a 3D performance boost. These kind of products are quite new and very pricey, and experiences with them can vary.

In our benchmarks, the Razer Blade did not disappoint. In most of the tests it was extremely close, but certain results came out up to 10 per cent faster. Unlike the other laptops on test, even when running 3D benchmarks, it also remained silent.

We're torn over the Razer Blade Advanced Model. It's definitely our favourite of the laptops on test, but given that it's the most expensive, and has relatively weedy storage, it's also arguably the worst value. You may pay slightly more for the Razer brand, but that also means better materials, and quieter operation. A tough call.

VERDICT ●●●●○

CONCLUSION

We feel a little spoiled by modern computing hardware. 3D laptops were hideous, heavy things only a few years ago, as clunky as they were chunky, with battery life that was measured in minutes, not hours.

But RTX Studio is an example of how those days are over, a showcase of how modern laptops can offer strong 3D performance without a weighty build. Noise levels are generally low and battery life in all the laptops we tested is good enough to carry on for roughly four to five hours, although this will drop off with 3D-intensive tasks.

As a brand that is focused exclusively on high-end performance, none of the current line-up of (approximately 16) RTX Studio laptops that are currently on the market will disappoint in 3D application performance, as our tests revealed.

The reduced clock speeds of the Max-Q laptop graphics cards may hamper performance compared with an equivalent desktop rig with a GeForce RTX 2080 running at full speed, but the benchmark results in OpenCL, Cuda and general 3D tests show these RTX Studio laptops still outperforming desktops from the previous Pascal GPU generation.

As all three laptops featured a combination of a GeForce RTX 2080 Max-Q and an Intel Core i7-9750H processor, the results were almost identical. The Razer Blade took the overall performance crown by a small margin, with a performance spike in some of the 3D tests, notably the OpenCL LuxMark test and SPECViewPerf 13.

> "RTX STUDIO IS A SHOWCASE OF HOW MODERN LAPTOPS CAN OFFER STRONG 3D PERFORMANCE WITHOUT A WEIGHTY BUILD"

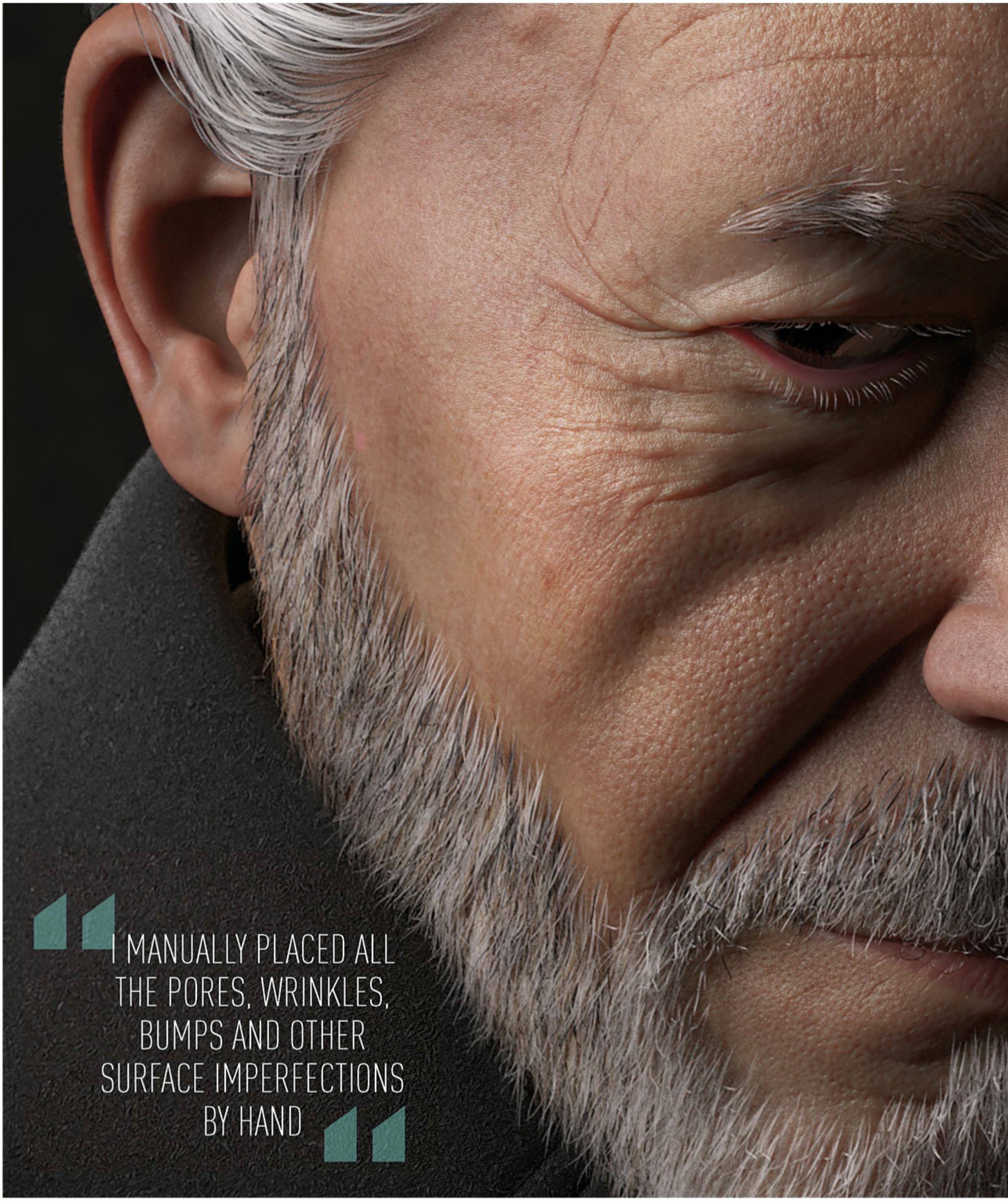
The rest of the hardware specification is evenly matched as well. All laptops on test have colour-accurate screens, but it was the more professional look, design and feel of the Razer Blade that made us prefer it – the minimalist black chassis, sparing use of tastefully coloured LEDs, and weighty feel to the aluminium material. That said, it's also the most expensive of the three laptops. Part of that might be the cost of the brand – Razer isn't known for being cheap.

The real Achilles' heel of RTX Studio is not the performance, but the pricing. Expect to pay the best part of £3,000 to own one of these laptops. Bearing this significant investment in mind, we'd recommend not skimping on memory and the SSD capacity, spending a small extra to upgrade both as far as you can.

But if that expenditure is too much to swallow, you can still get real design work done with a more affordable RTX Studio laptop that has a slightly less powerful graphics cards. The MSI P65 Creator for example is a 15.6-inch model with an RTX 2060, but still equipped with a six-core Intel processor and 4K colour-accurate display for £2,000. Likewise, the Gigabyte Aero 15X is available with an RTX 2070 for £2,400.

We've been thoroughly impressed by the concept of RTX Studio and appreciate how Nvidia has worked with various manufacturers to offer such excellent performance. However, it's also good to know that manufacturers are still free to sell 3D laptops that don't fit Nvidia's RTX Studio specification.

For example, we've seen laptops use full-fat desktop graphics cards rather than Max-Q versions for even more performance at the expense of portability and battery life. That means they can't be branded as RTX Studio laptops. Some designers prefer that kind of configuration, so it's good to know that choice will continue to exist in the future.


I MANUALLY PLACED ALL THE PORES, WRINKLES, BUMPS AND OTHER SURFACE IMPERFECTIONS BY HAND

Technique focus

Incredible 3D artists take us behind their artwork

SURFACE DETAILING In order to accomplish a high level of detail on the face for this image, I actually decided to do it by hand. By manually placing all the pores, wrinkles, bumps and other surface imperfections, I could not only decide where I wanted them to appear, but also adjust their size and intensity as desired.

I created a couple of custom alphas in ZBrush and also made use of some stock ones. Patience is key but there is no need to go crazy, symmetry is always there to help you.

This sort of stylised approach gives the artist more freedom to present a solid and convincing work, and most importantly in my opinion, it's fun.

Gustavo Monteiro Suzuki
artstation.com/artmonteiro

Gustavo Monteiro Suzuki is an aspiring 3D character artist from Brazil. He has been studying character creation for around four years.

Norman 2019

Software Maya, Arnold, Marvelous Designer

IN THE VAULT

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VIDEO

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Follow along with Mike Griggs' video on Trypogen, a plugin for Cinema 4D that enables the easy creation of complex abstract shapes.

VIDEO + ASSETS

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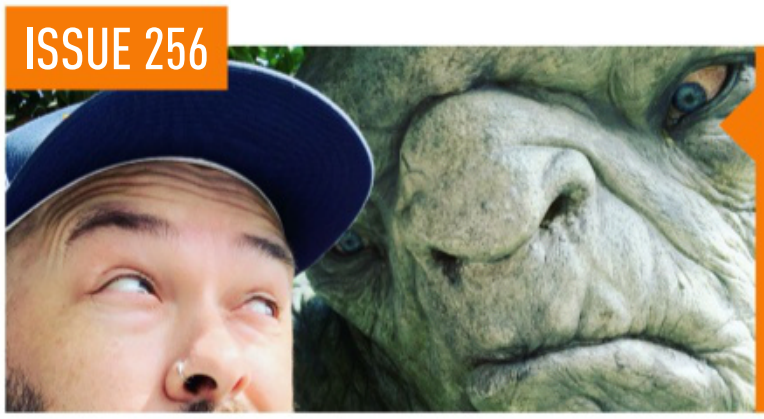
All the project files you need to follow along with Part 1 of Rusty Hazelden's RenderMan tutorial.

VIDEOS

Q&A

Oscar Juárez and Pietro Chiovaro share their processes for their Q&A topics this issue.

ISSUE 256



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